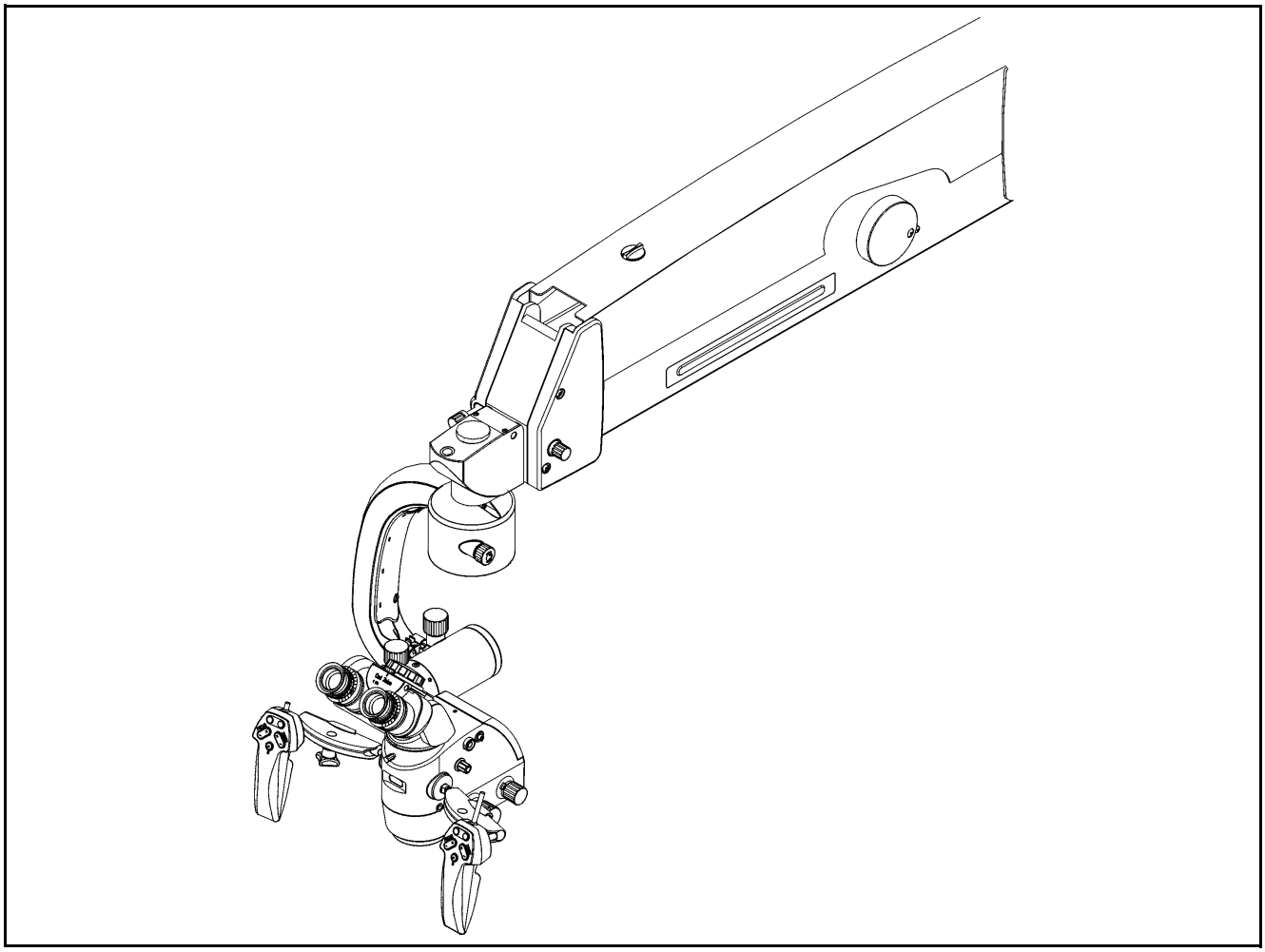
# OPMI Vario®
# Retrolux® System



## Instructions for use

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## Key to symbols

Different symbols used in this manual draw your attention to safety aspects and useful tips. These symbols are explained in the following.

**Warning!**
The **warning triangle** indicates potential sources of danger which may constitute a risk of injury for the user or a health hazard.

**Caution:**
The **square** indicates situations which may lead to malfunction, defects, collision or damage of the system.

Note:
The **hand** indicates hints on the use of the system or other tips for the user.

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# Functions at a glance

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# OPMI® VARIO

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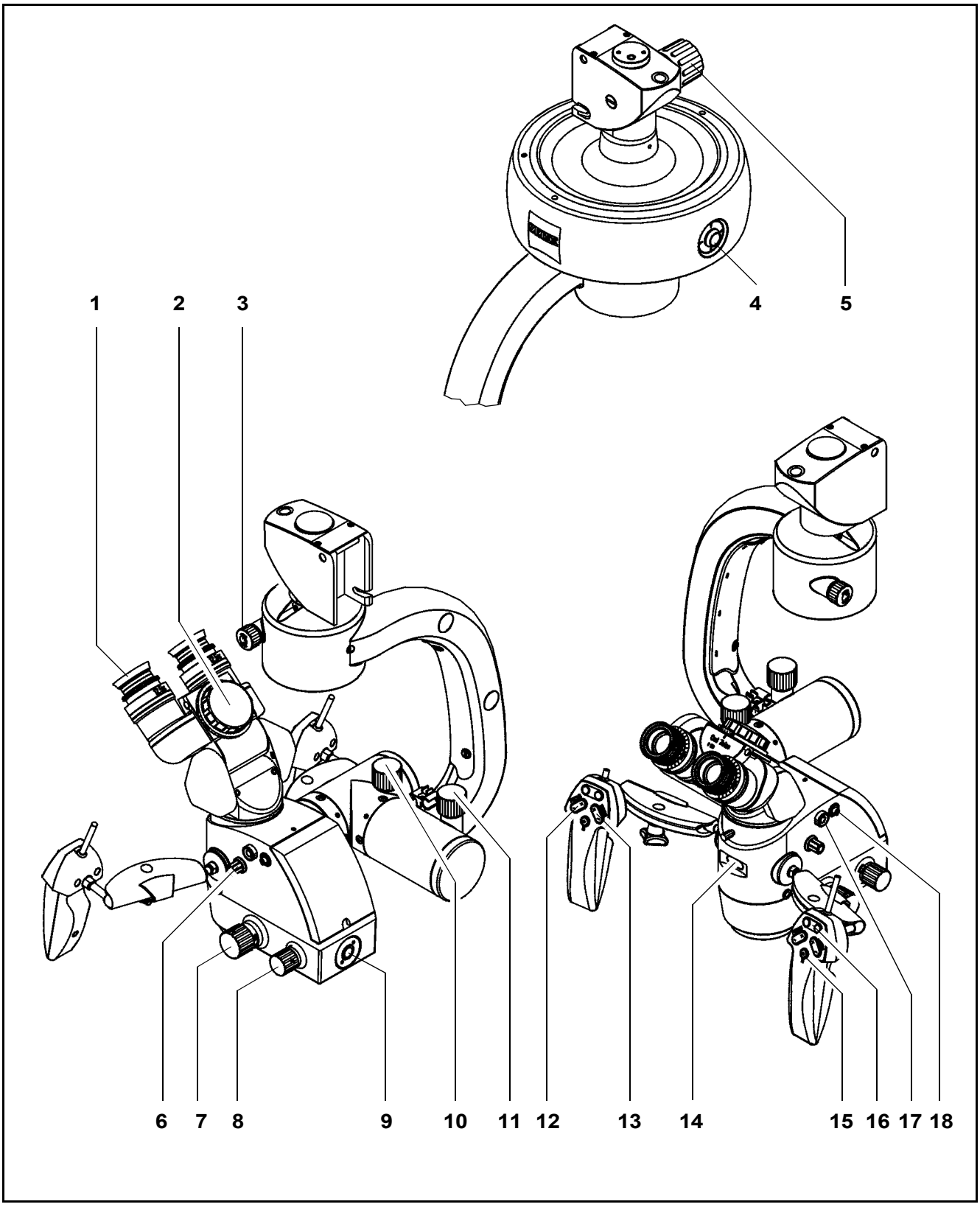
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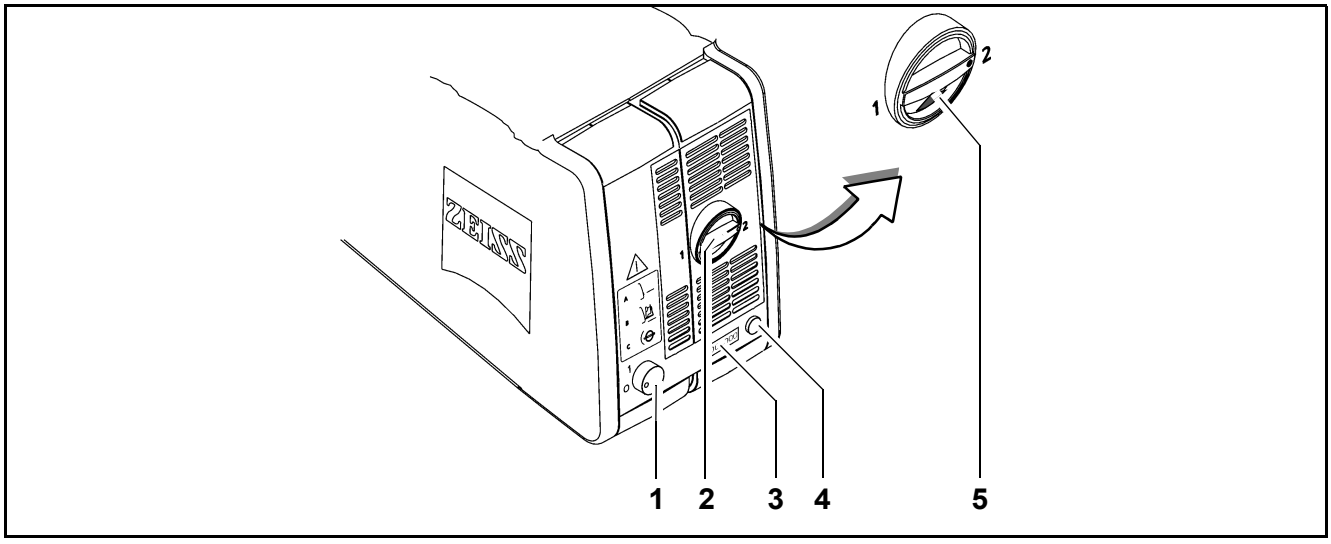

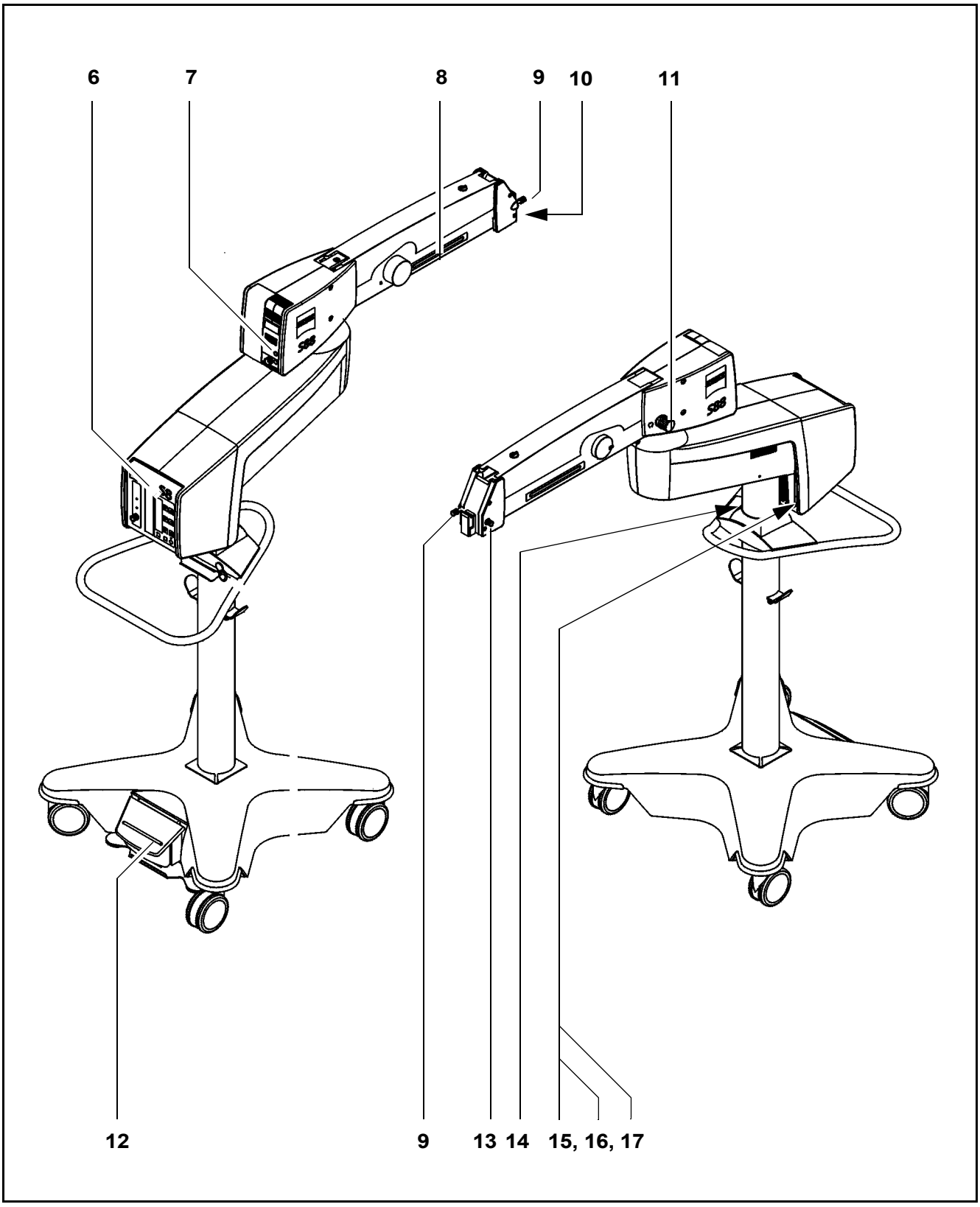
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# Safety

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The device described in this manual has been designed and tested in accordance with Carl Zeiss safety standards as well as German and international standards. This guarantees a high degree of instrument safety.

The system described in this user manual has been designed in compliance with the requirements of:

– EN – IEC – UL – CSA

In accordance with Directive 93/42/EEC for medical devices, the complete quality management system of the company Carl Zeiss Surgical GmbH, 73446 Oberkochen, Germany, has been certified by DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen GmbH, a notified body, under registration number 250758 MP23.

– As per Directive 93/42/EEC, the unit is a Class I instrument.

– For USA: FDA classification Class I.

We would like to provide you with information about safety aspects which must be observed when handling this device. This chapter contains a summary of the most important information concerning matters relevant to instrument safety.

Important safety information has been incorporated in this manual and is marked with a warning triangle accordingly. Please give this information your special attention.

The correct use of the system is absolutely vital for safe operation. Please make yourself totally familiar with the contents of this manual prior to start-up of the instrument. Please also observe the user manuals of any additional equipment. Further information is available from our service department or from authorized representatives.

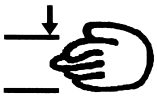
- Please observe all applicable accident prevention regulations.
- The instrument must be connected to a special emergency backup line supply in accordance with the regulations or directives which apply in your country.

## Notes on installation and use

### Safe working order

- Do not operate the equipment contained in the delivery package in
  - explosion-risk areas,
  - the presence of inflammable anesthetics or volatile solvents such as alcohol, benzine or similar chemicals.
- Do not station or use the instrument in damp rooms. Do not expose the instrument to water splashes, dripping water or sprayed water.
- Switch off the unit at the power switch if you notice any smoke, sparks or unusual noise. Do not use the unit until it has been repaired by our service team.
- Do not place any fluid-filled containers on top of the instrument. Make sure that no fluids can seep into the instrument.
- Do not force cable connections. If the male and female parts do not readily connect, make sure that they are appropriate for one another. If any of the connectors are damaged, have our service representative repair them.
- Potential equalization: The instrument can be incorporated into potential equalization measures. For this purpose, contact our service department.
- Do not use a mobile phone in the vicinity of the equipment because the radio interference can cause the equipment to malfunction. The effects of radio interference on medical equipment depend on a number of various factors and are therefore entirely unforeseeable.
- Modifications and repairs on these instruments or instruments used with them may only be performed by our service representative or by other authorized persons.
- The manufacturer will not accept any liability for damage caused by unauthorized persons tampering with the instrument; this will also forfeit any rights to claim under warranty.
- Over longer distances (e.g. removal, return for repair, etc), the instrument may only be transported in the original packaging or in special return packaging. Please contact your dealer or the Carl Zeiss service team.
- Use this instrument only for the applications described.

- Only use the instrument with the accessories supplied. Should you wish to use other accessory equipment, make sure that Carl Zeiss or the equipment manufacturer has certified that its use will not impair the safety of instrument.
- Only personnel who have undergone training and instruction are allowed to use this instrument. It is the responsibility of the customer or institution operating the equipment to train and instruct all staff using the equipment.
- Keep the user's manuals where they are easily accessible at all times for the persons operating the instrument.
- Never look at the sun through the binocular tube, the objective lens or an eyepiece.
- Do not pull at the light guide cable, at the power cord or at other cable connections.
- This instrument is a high-grade technological product. To ensure optimum performance and safe working order of the instrument, its safety must be checked once every 12 months. We recommend having this check performed by our service representative as part of regular maintenance work.
  If a failure occurs which you cannot correct using the trouble-shooting table, attach a sign to the instrument stating it is out of order and contact our service representative.



- Observe the labels showing the symbol "Risk of crushing“!

**Notes on EMC (electromagnetic compatibility)**

The system meets the EMC requirements of IEC 60601-1-2. During use of the system, the precautionary measures concerning EMC listed below must be observed.

Only use accessories that have been approved by Carl Zeiss for this system.

Do not use any portable or mobile high frequency communication devices in the vicinity of the system, as this may lead to an impairment of its function.

The system complies with the limits for a Class A device concerning radio frequency emission. However, the possibility of interference to high frequency receiving devices (e.g. TV sets or radios) being used in the surroundings cannot be ruled out. If interference of this type occurs, please inform your Carl Zeiss Service.

### Connection of a laser micromanipulator

The link-up of a laser micromanipulator with the OPMI results in a medical system for which the system manufacturer must meet the necessary requirements (approval, qualification, laser protection, etc.). Please note the user manuals provided by the laser micromanipulator manufacturer and laser manufacturer. Further information is available from our service department or from authorized representatives.

### Connection of navigation systems (option)

The Carl Zeiss components "Surgical microscope on suspension system" can be integrated into an external navigation system. An optional navigation interface is available.

- The manufacturer of the external navigation system (system supplier) is responsible for the following:
  - Confirmation that his navigation systems have been tested and certified for operation with the respective Carl Zeiss surgical microscope on a suspension system in accordance with the requirements specified in the Carl Zeiss interface description "Navigation Interface for Carl Zeiss Surgical Microscopes".
  - Meeting all requirements (approval, qualifications, etc.) for the medical system created through coupling via the navigation interface.
  - Provision of all accompanying documents required.
  - Ensuring that the navigation system is only connected by personnel who have undergone appropriate training and instruction.
  - Contacting the local Carl Zeiss representative for any inquiries that may arise.
  - Implementation of a procedure that guarantees the calibration of the surgical microscope which is absolutely vital for the use of the Carl Zeiss components "Surgical microscope on suspension system" in combination with a connected navigation system.
    This allows the calibrated surgical microscope combined with the navigation system to be used like an optical pointer with a variable length (corresponds to the working distance).
  - Conducting complete functional testing, alignment and calibration (landmark test) of the navigation system after every subsequent installation or exchange of navigation system components
  - Incorporation of a regularly changing icon in the data injection display of surgical microscopes equipped with a data injection system, i.e. the "heartbeat" of the navigation system must be constantly visible for the user to permit data transmission errors to be immediately detected.
- To check the accuracy of the overall system, perform the test specified by the navigation system manufacturer, e.g. the landmark test, also using the surgical microscope. This allows you to ensure that the stereotactic data has been correctly generated and transmitted to the navigation system without errors.

- Do not use any rotatable tube dovetail mounts when operating the surgical microscope with a connected navigation system. If mounts of this type have been attached to the microscope, they must be carefully locked in their central positions (tighten the knurled screw for rotation).

**Requirements on the antenna design (non-Zeiss antennas)**

- The antenna manufacturer must confirm that his antenna has been tested and certified for operation with the respective Carl Zeiss surgical microscope on a suspension system in accordance with the requirements specified in the Carl Zeiss interface description "Navigation Interface for Carl Zeiss Surgical Microscopes".
- The following requirements, in particular, apply to the antenna:
  - The surgical microscope with accessories and the antenna must not exceed the admissible total weight (see label or the chapter "Technical data").
  - The antenna must not project over the bottom edge of the microscope body in the direction of the surgical field.
  - The antenna must neither obstruct the movement and adjustability of the accessories which can be used on the surgical microscope (usually a stereo coobservation tube, a camera adapter, a face-to-face tube for spinal surgery, a laser micromanipulator) nor collide with these accessories.
  - The antenna configuration must be implemented in such a way that the localizer camera can always "see" the diodes or trackballs when the surgical microscope and its accessories are in their usual positions.
  - When the system's internal antenna wiring is used, the EN60601-1-2 standard (electromagnetic compatibility) must be complied with.
  - The output power of the LEDs or infrared LEDs (IRED) must always comply with the IEC 60825 laser safety standard, even in the event of cable defects.
  - The failure of one or several LEDs of the antenna may impair navigation or lead to navigation failure. Take the necessary precautions.

**Requirements for operation**

- Our service representative or an expert authorized by us will install the system. Please ensure that the following requirements are met for further operation:

– All connecting components (details in the user's manual) which are relevant to system safety have been properly connected, and the screw connections have been firmly tightened.

– All cables and plugs are in perfect condition.

– The voltage set on the instrument corresponds to the rated line voltage on the site of installation.

– The power cord has been plugged into a power outlet which has a properly connected protective ground contact.

– The power cord being used is the one designed for use with this system.

**Before every use and after re-equipping the instrument**

- Make sure that all ”Requirements for operation” are fulfilled.
- Go through the checklist.
- Re-attach or close any covers, panels or caps which have been removed or opened.
- Pay special attention to warning symbols on the instrument (triangular warning signs with exclamation marks), labels and any parts such as screws or surfaces painted red.
- Do not cover any ventilation openings.

**For every use of the instrument**

General

- Never operate the system unattended.
- Avoid looking directly into the light source, e.g. into the microscope objective lens or a light guide.
- When the illumination is on, the light guide must be connected at both ends. Otherwise there is a risk of fire or burn injuries.
- Make sure that the instrument has been switched off before you change the xenon lamp module. When switched on, the ignition system generates high voltage.
- The xenon illumination system is a high-intensity light source which - if used improperly - can cause thermal injury to skin or tissue. Keep the exposed tissue moist and provide sufficient irrigation. Carefully monitor the effects of the illumination on the tissue, in particular in the following cases:

– during prolonged procedures on skin and tissue using objective lenses with a short focal length (short working distance),

– during procedures on tissue with a low blood supply,

– with high brightness settings of the xenon lamp.

**Warning!**
Due to the high luminance of the xenon lamp and its light spectrum, which resembles that of natural daylight, its use in ophthalmic applications is only permissible in combination with the Retrolux illumination module.

- Any kind of radiation has a detrimental effect on biological tissue.This also applies to the light illuminating the surgical field. Please therefore reduce the brightness and duration of illumination on the surgical field to the absolute minimum required.
- Using the locking pedal on the base, secure the stand in position. Make sure that the stand is stable and cannot roll away.

**After every use of the instrument**

- Always use the main power switch of the instrument to turn it off.
- The main power switch must always be turned off when the instrument is not in use.

## Phototoxic retinal injury in eye surgery

**General**

Several papers[1)-5)] dealing with the problem of phototoxicity in ophthalmic surgery have been published. A comprehensive review of these publications reveals five aspects of particular concern:

– Illumination characteristics (spectral composition)

– Illumination intensity

– Angle of illumination

– Focus of the light source

– Exposure time to light

In the following, comments on these aspects are given and a description of how Carl Zeiss, as a manufacturer, makes allowance for them in its systems.

### Illumination characteristics (spectral composition)

Studies on the exposure of the eye to light of varying spectral composition date back to the early 1950s. These studies suggest that the potential hazard of phototoxic injury to the patient's retina can be reduced by blocking out the blue and ultraviolet light below a wavelength of 475 nm.

An important point to note here, however, is that the use of filters will inevitably change the perceived color of the light. For this reason, the physician may initially have to get used to the changed appearance of the anatomical structures.

### Illumination intensity

The majority of researchers suggest that the surgeon should use the lowest light intensity required at the patient's eye to guarantee good viewing during surgery.

Carl Zeiss has addressed this aspect by providing its systems with a device for continuously varying the brightness of the light source. This permits the surgeon to optimally adapt the light intensity at the patient's eye to the conditions existing in each case.

### Angle of illumination

A number of publications[1)-4)] suggest that the microscope should be tilted to reduce the exposure of the macula to direct illumination.

Carl Zeiss ophthalmic surgical microscopes are therefore equipped with the following:

– Tilting mechanism for the microscope body

### Focus of the light source

Studies show that injuries are likely to occur if the filament of the light source is imaged on the patient's retina. The peak intensity of a filament is considerably higher than that of an even and extended light source such as a light guide.

This is the reason why Carl Zeiss uses fiber optic illumination in its surgical microscope systems.

### Exposure time to light

According to some publications, the phakic and aphakic eye should not be exposed to the light source longer than a few minutes. In all surgical cases, the retinal exposure time depends on the type and duration of the procedure and possible case complications. It is therefore recommended

in ophthalmic surgery to keep the light intensity as low as possible, or to use a device which prevents the light from entering through the patient's pupil. It is alsorecommended to make sure that the patient's eye is not additionally exposed to the light of surrounding light sources. This problem has been solved by Carl Zeiss by the use of a retinal protection device that can be swung into the illumination beam path of the Retrolux illumination module.

**Brightness control**

The brightness control scale of our systems has a linear structure with values ranging from 1 to 10. The stipulations of standard ISO/DDIS 15004-2:2006(E) result in maximum radiation exposure times for the different illumination configurations as specified in the table "Maximum radiation exposure times".

The microscope light source - like any bright light source - may present a hazard to the patient's eye both in the form of immediately visible thermal damage to the retina as well phototoxic chemical reactions which may lead to photoretinitis. The factors which play an important role in determining the phototoxic risk are:

- Lamp brightness.
- Spectral distribution of the light (UV and blue are more dangerous that longer wavelengths).
- Duration of direct exposure.
- Pupil size.
- Clarity of ocular media (infants and young children, for example, may be at a higher risk).
- Phakic status of the eye (aphakic and pseudo-aphakic eyes without UV and blue filtering IOLs are at a higher risk).
- Previous exposure to bright light such as retinal photography, especially within the last 24 hrs.

The following table is intended to provide the surgeon with a guideline in determining the potential hazard. The data has been calculated for a worst-case scenario of direct, uninterrupted exposure of an aphakic eye with an 8 mm dilated pupil. The calculations are based on the recommended occupational health daily exposure limits as defined in [6)]. A safety factor of 10 has been used in determining these limits.

During cataract procedures, factors such as lenticular material, instruments such as the phaco handpiece, and movement of the eye provide interruption of the exposure and would be expected to significantly lengthen the time before photoretinits might be expected to occur.

A prospective study [7)] of the effects of microscope illumination during surgery did not reveal any phototoxic retinal injuries for procedure times of up to 30 minutes if the calculated maximum recommended exposure time was 150 seconds. However, it was also found that at the same brightness setting, phototoxic retinal injury could be expected after approximately 100 min.

Carl Zeiss recommends the following measures in order to minimize phototoxic risk:

- Always use the lowest possible brightness setting.
- When working on the exterior eye, use the retinal protection device to prevent light from entering the pupil, especially when the pupil is dilated.
- Turn off the microscope illumination system or cover the patient's eye during pauses in surgery.

The following table shows the maximum radiation exposure to the xenon illumination.

**Maximum radiation exposure times**

| Illumination display scale | Max. exposure time |
|---|---|
| 2,5 | 3.4 minutes |
| 5,0 | 1.5 minutes |
| 7,5 | 1.0 minutes |
| 10 | 0.8 minutes |

**Warning!**
This exposure time must not be exceeded, as serious eye injury could otherwise be caused by the xenon illumination.

Note:
A UV blocking filter is contained as a standard feature in the Retrolux illumination module on the microscope side.

This helps the surgeon to reduce the risk of phototoxic retinal injury in the patient.

List of references

1) H. Stiller, and B. Rassow, "Light hazards to the patient's retina from ophthalmic instruments," Applied Optics-OT 30, 2187-2196 (1991).

[2] American Conference of Governmental Industrial Hygienists, "Documentation of the Threshold Limit Values for physical agents. 7th Edition," (American Conference of Governmental Industrial Hygienists, Cincinnati, 2001).

[3] S. G. Khwarg, F. A. Linstone, S. A. Daniels, S. J. Isenberg, T. A. Hanscom, M. Geoghegan, and B. R. Straatsma, "Incidence, risk factors, and morphology in operating microscope light retinopathy," Am. J. Ophthalmol. 103, 255-263 (1987).

[4] G. Kleinmann, P. Hoffman, E. Schechtman, and A. Pollack, "Microscope-induced retinal phototoxicity in cataract surgery of short duration," Ophthalmology 109, 334-338 (2002).

[5] ISO/FDIS 15004-2:2006(E) Optical instruments -- Fundamental requirements and test methods -- Part 2: Light hazard protection

[6] David Sliney, Danielle Aron-Rosa, Francois DeLori, Franz Fankhauser, Robert Landry, Martin Mainster, John Marshall, Bernard Rassow, Bruce Stuck, Stephen Trokel, Teresa Motz West, and Michael Wolffe, Adjustment of guidelines for exposure of the eye to optical radiation from ocular instruments: statement from a task group of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) APPLIED OPTICS Vol. 44, No. 11, p 2162 (10 April 2005)

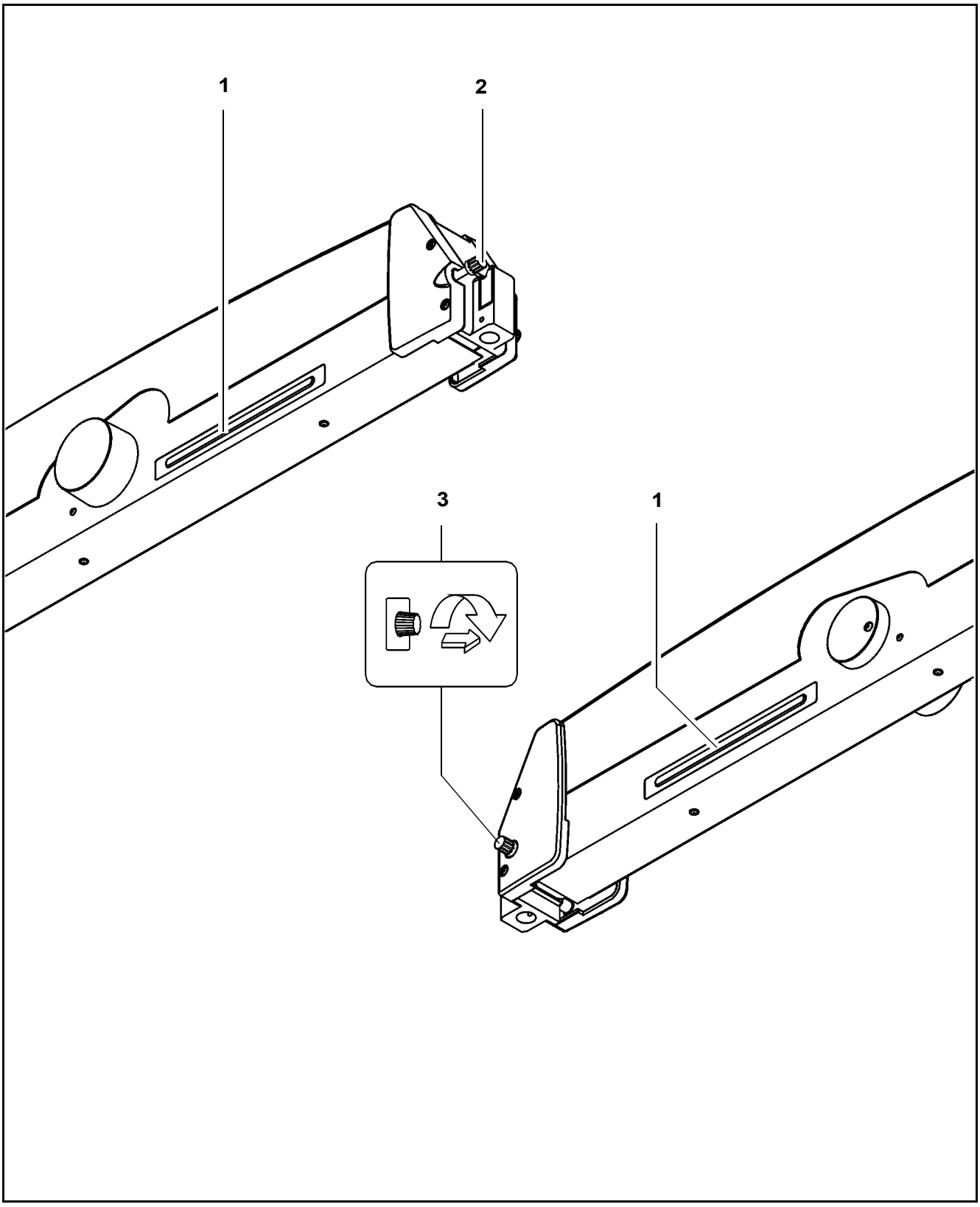
[7] Byrnes, G.A., Antoszyk, A.N., Mazur, D.O., Kao, T.C., Miller, S.A., Photic maculopathy after extracapsular cataract surgery. A prospective study, 1992/05/01 Ophthalmology, VL - 99, IS - 5, SP - 731, EP - 737, PB - Elsevier

## Safety devices of the suspension systems

**1** Release bar
Allows non-sterile persons to release the magnetic brakes of the suspension system.

**2** Adjustment screw for limiting the downward travel
Use this screw to set the minimum vertical distance (working distance) from the surgical field. Check this setting before each surgical procedure.

**3** Locking knob
for locking the suspension arm in its horizontal position.
Before removing or attaching a unit (microscope, tube, etc.), move the suspension arm into a horizontal position. Pull out the locking knob and turn it clockwise or counterclockwise through 180°, while slightly moving the suspension arm up and down until the lock engages. When locked, the suspension arm can no longer suddenly spring upward when insufficient weight is attached. After attaching a unit, perform the balancing procedure.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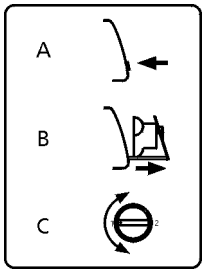
## Xenon illumination system

**Warning!**
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.




**1** Switching to the backup bulb
The lamp module contains two xenon bulbs. The second bulb is used as a backup bulb which must be swung into the illumination beam path if the first bulb fails.

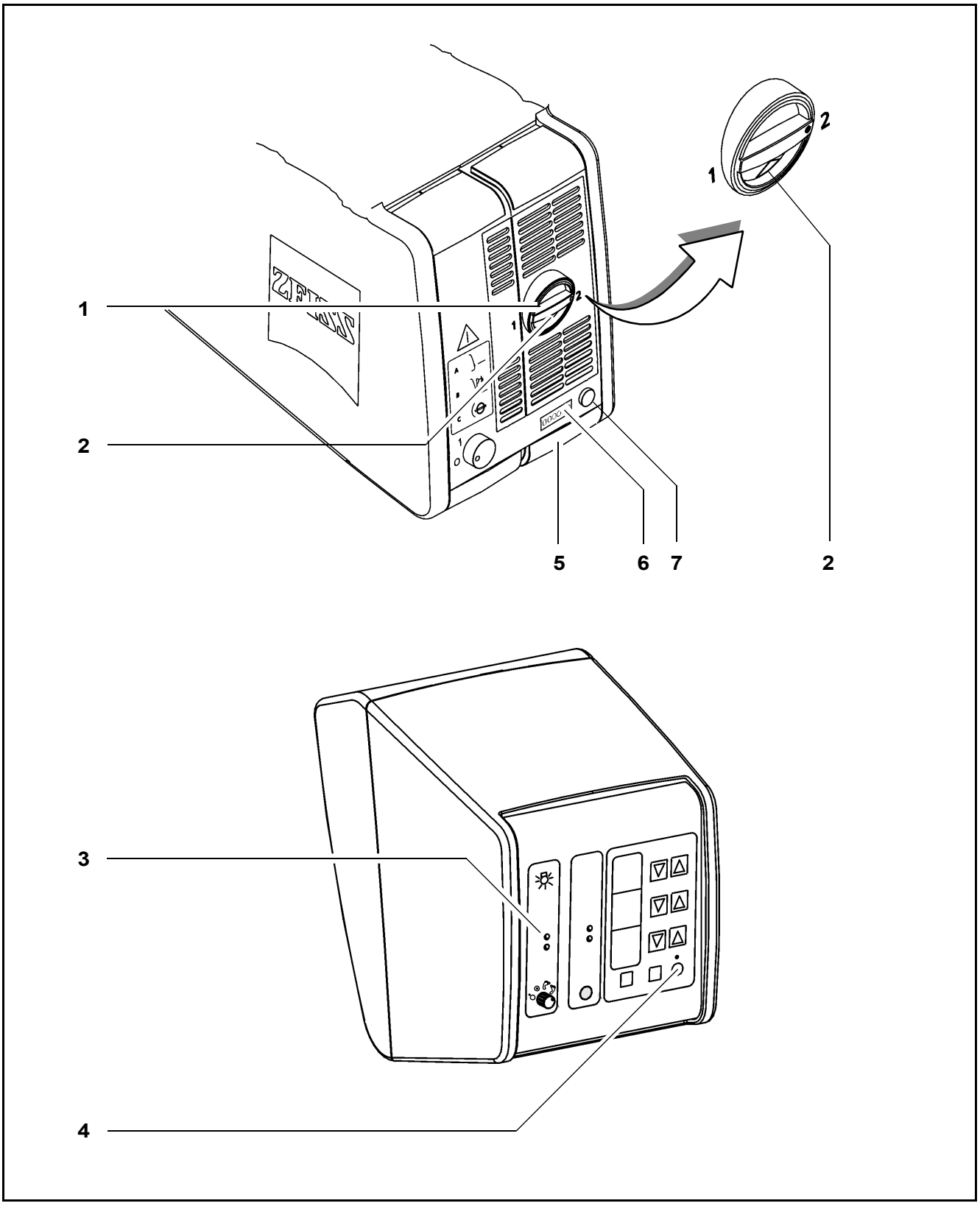
- If the xenon bulb fails, open the lamp module as follows: Press button (7). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (1) 180° until it snaps in place. This moves the backup bulb into the illumination beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset service hour counter (6) to "0". Use a pointed object and press it into the recess of reset button (5).

**2** Indicator: backup bulb is in use
When the red segment in the knob (1) lights up, the backup bulb is in use.

Note:
If the first bulb has failed and the backup bulb is in use, make sure to have a backup lamp module at hand as a precaution.

**3** Yellow indicator lamp
Lights when the bulb has failed, or if the lamp module is defective. After activation and ignition of the backup bulb, the yellow indicator lamp turns off again.

**4** Manual function
When the manual function has been activated, all electrical control systems are disabled. The bulb brightness is automatically adjusted to a fixed setting.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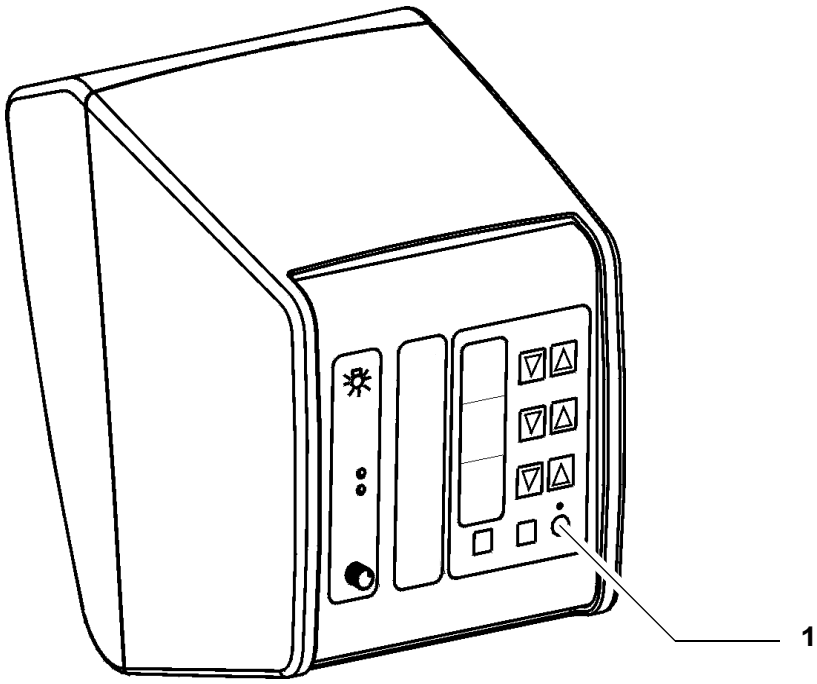
### Manual function

**1** Manual key
The Manual key permits you to switch to manual operation. The motorized control functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a fixed setting, the value being shown in the first display section.
When the manual mode is activated, the yellow LED is lit and the word "MANUAL" blinks in the third display section.

The surgical microscope can no longer be operated via the foot control panel, the handgrips or the display and key field.
In the manual mode, you can only switch the illumination on and off on the foot control panel and release the magnetic brakes by pressing the appropriate key on the surgical microscope.

The manual mode is retained even if you turn the power switch of the instrument off and on again.

Press the Manual key once again to reactivate electronic control; the display in the display and key field then returns to the basic mode.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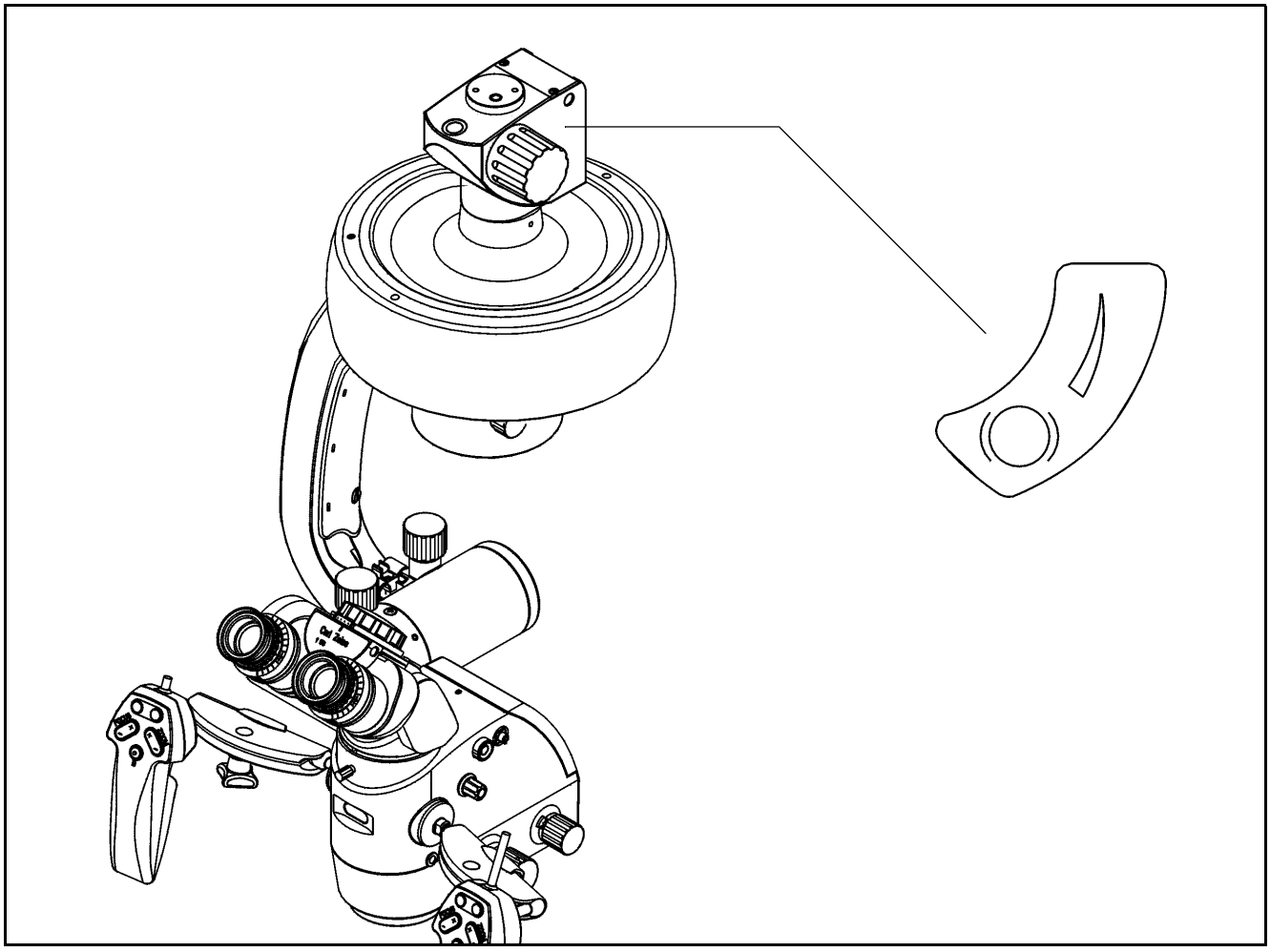
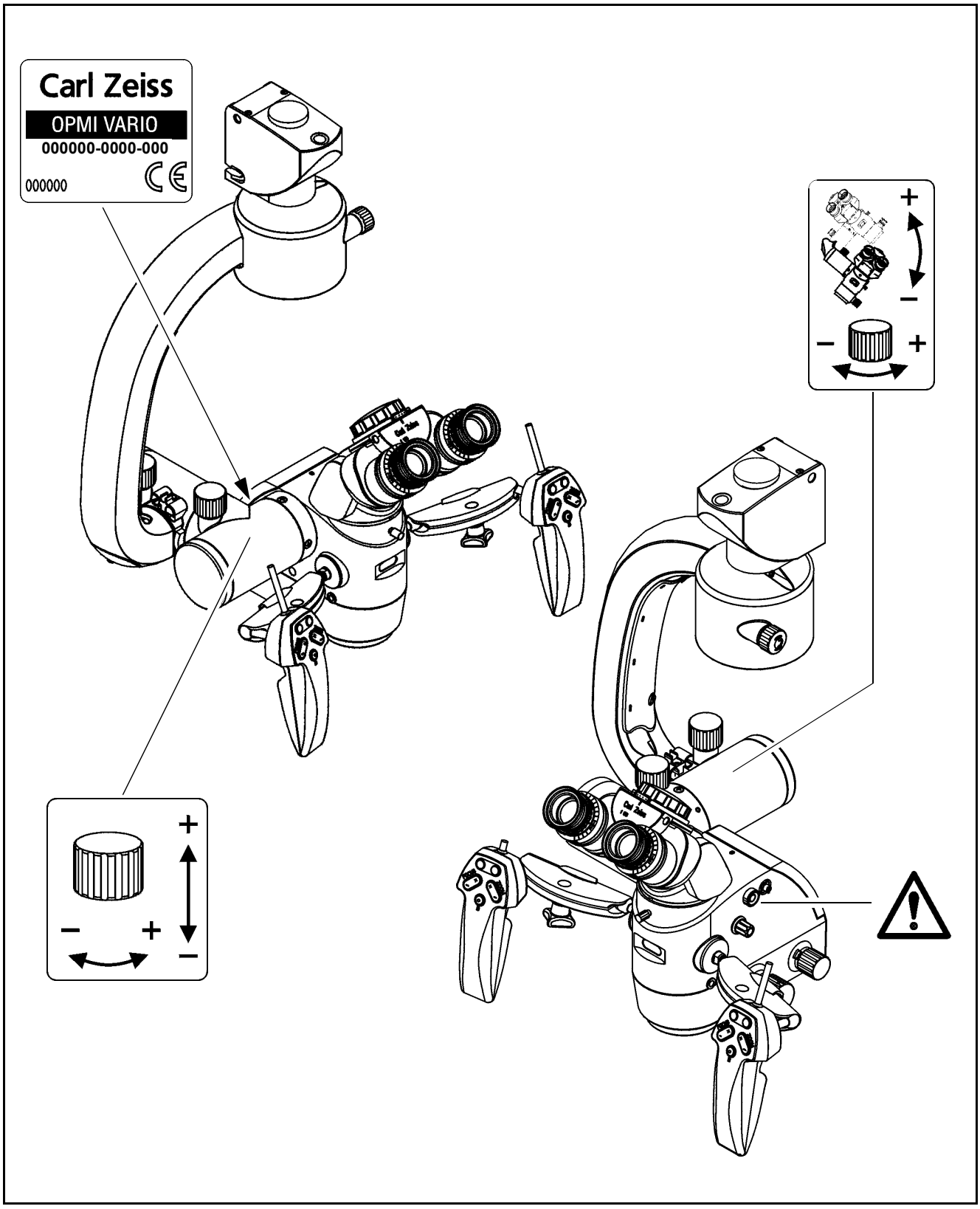
## Warning labels and notes

**Caution:**
Observe all warning labels and notes!
If any label is missing on your instrument or has become illegible, please contact us or one of our authorized representatives. We will supply the missing labels.

**OPMI VARIO**

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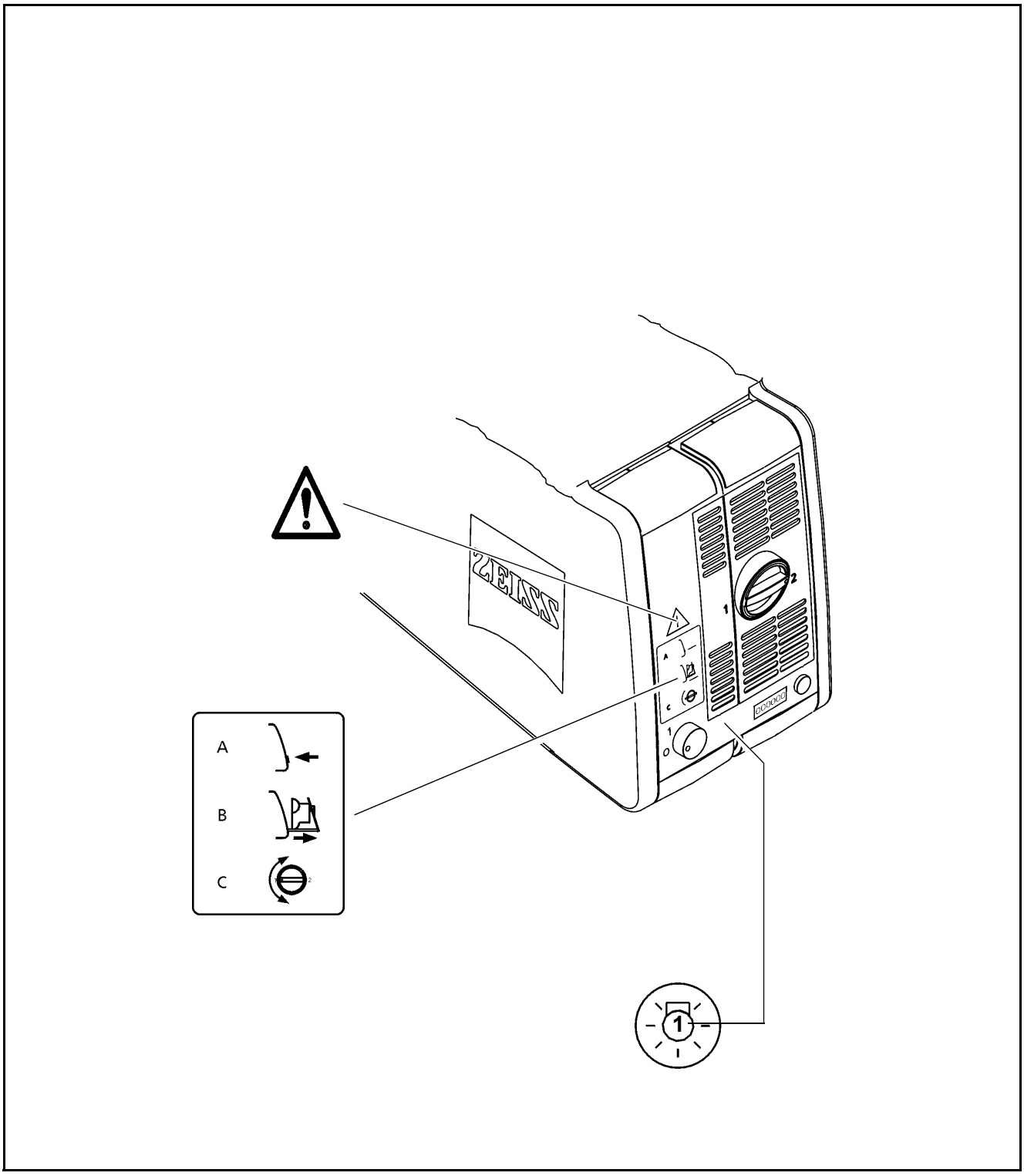
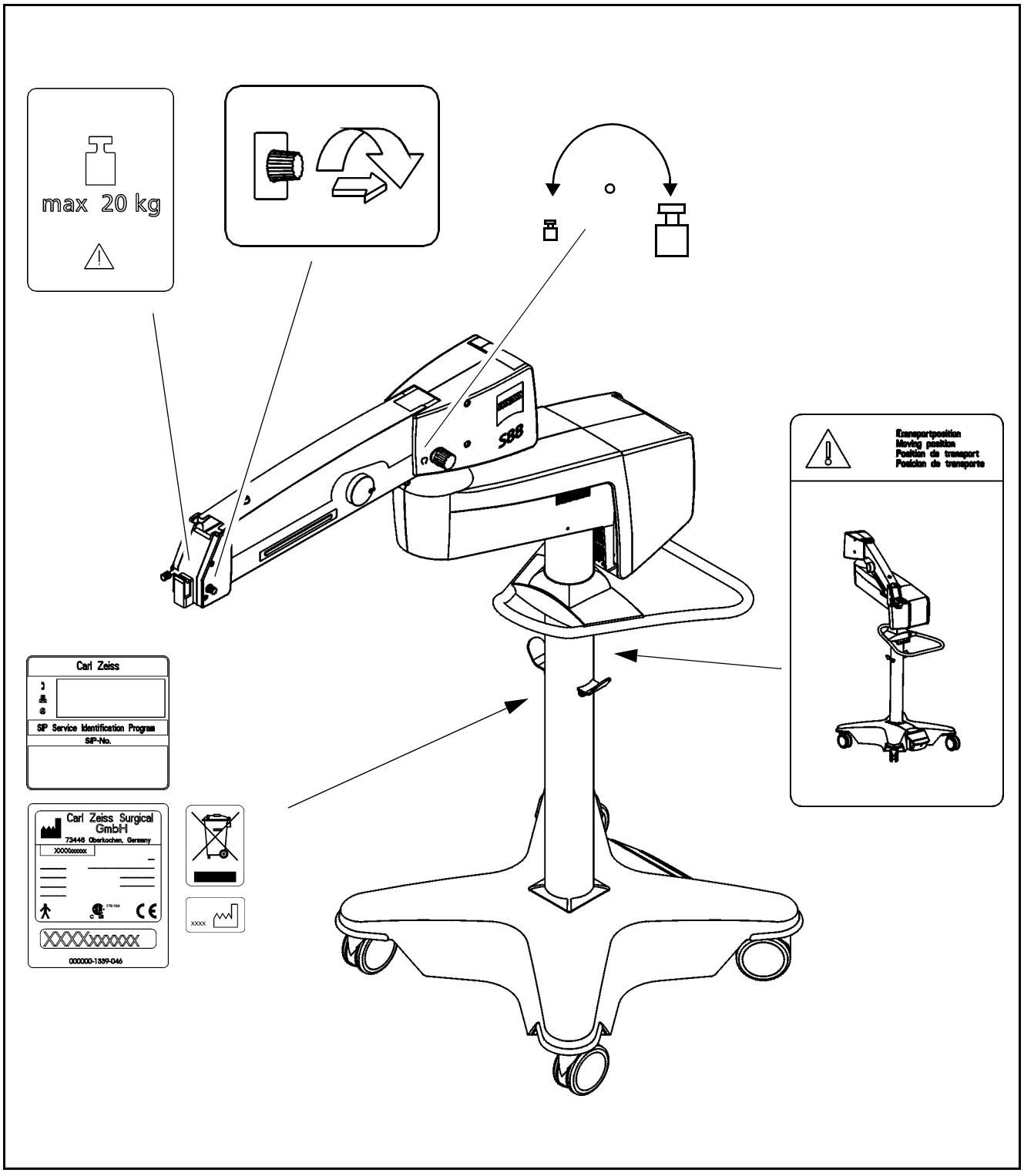
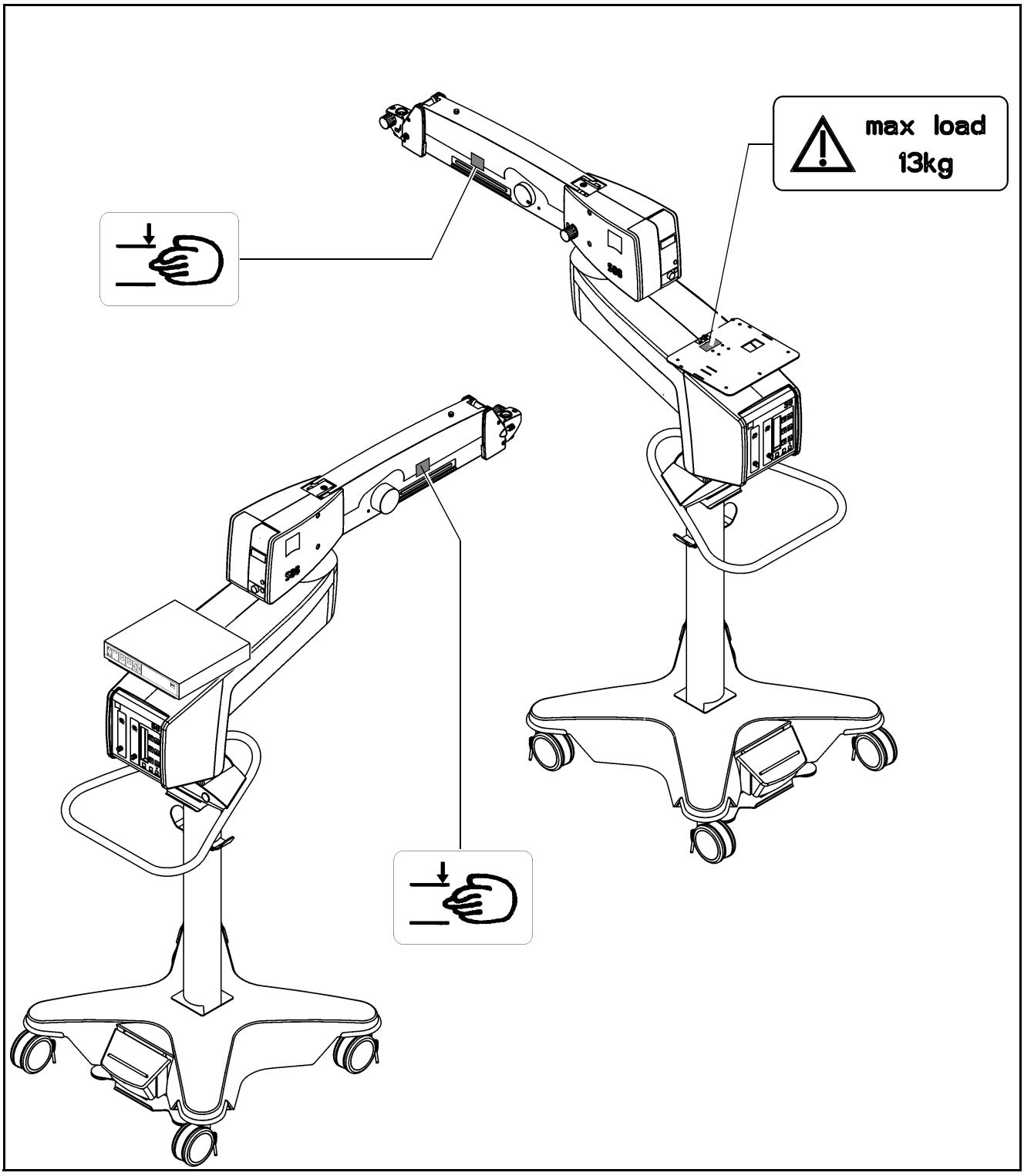
## Suspension systems - xenon illumination system



## S88 floor stand



**S88 floor stand with instrument tray option**



# Description

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# OPMI Vario Retrolux System

## Intended use

The OPMI® VARIO Retrolux System is a surgical microscope designed for reconstructive and plastic surgery, for neurosurgery and multidisciplinary use. In combination with the Retrolux illumination module, it can also be used for ophthalmic procedures.

The S88 floor stand powers and controls the motorized functions of the surgical microscope. The hallmarks of the S88 floor stand are its superb mobility and easy operation. Four steerable casters on the stand base permit easy positioning in the OR. The motorized functions of the surgical microscope can be controlled using a foot control panel.

The system has been designed for use in hospitals, clinics or other human medicine institutions.

The system must only be operated by physicians, nurses and other OR staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

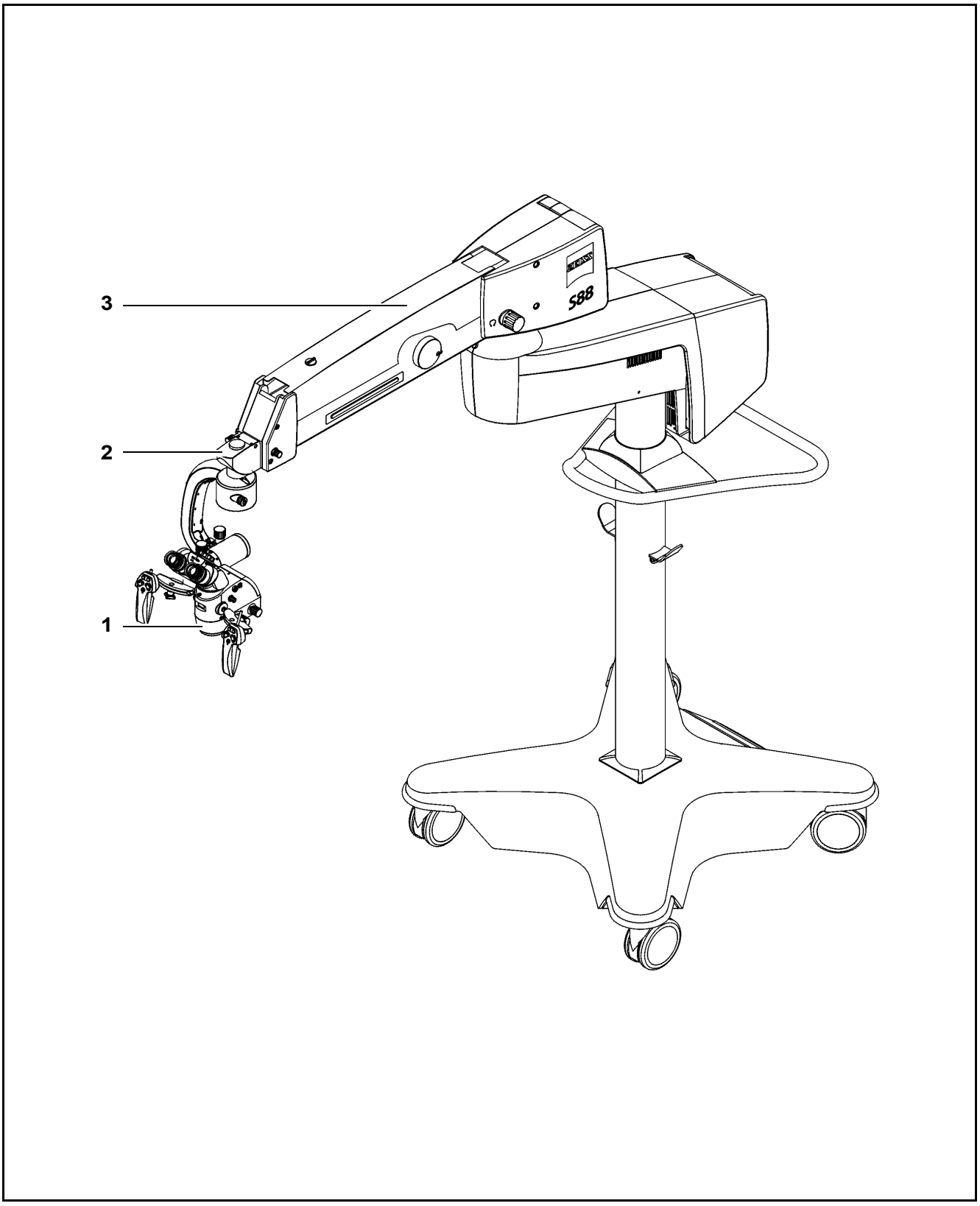
– low vibration
– clean environment
– avoidance of extreme mechanical stress.

## Components of the OPMI Vario Retrolux System

**1** Surgical microscope

**2** Coupling

**3** S88 floor stand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# Components of the surgical microscope

The surgical microscope comprises the following modules:

**1** Coupling
for mounting the surgical microscope on the suspension system.

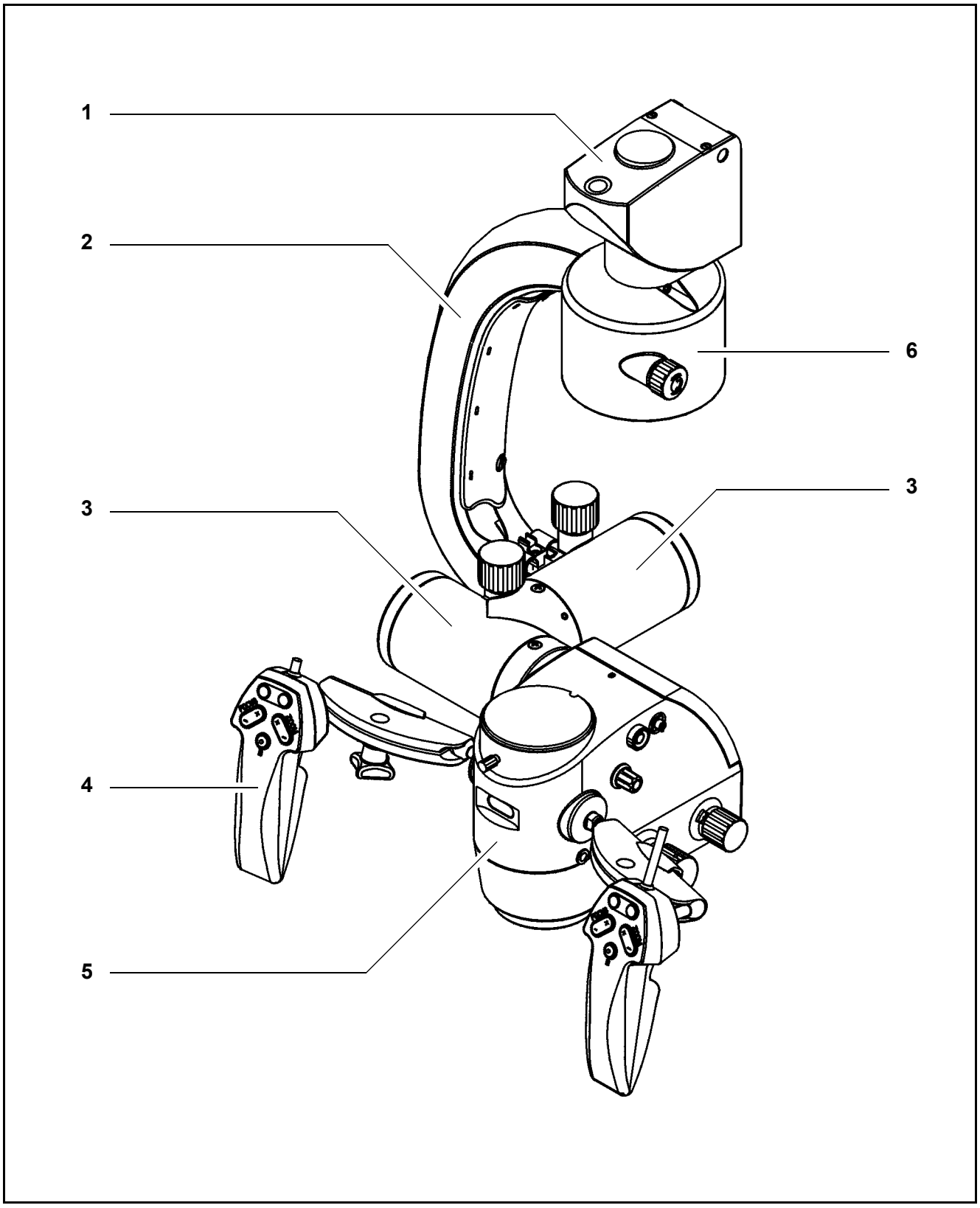
**2** Support arm for surgical microscope

**3** Balancing system including magnetic brakes
This system allows balancing of the surgical microscope. When the magnetic brakes are unlocked, the surgical microscope can be positioned almost effortlessly.

**4** Handgrips
for moving the surgical microscope. The buttons on the handgrips permit you to control major microscope functions such as unlocking/locking the magnetic brakes, focusing, zooming.

**5** Microscope body
The apochromatic optics of the microscope provide superb optical quality. The microscope image displays optimum contrast and excellent detail recognition along with a large depth of field. The 1:6 ratio zoom system allows the magnification of the overall system to be set as required by the surgical procedure.

**6** Magnetic brake
for the vertical axis.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## Controls, displays, connections

**1** Friction adjustment of the vertical axis
Use this knob to adjust the friction of the vertical axis as required.

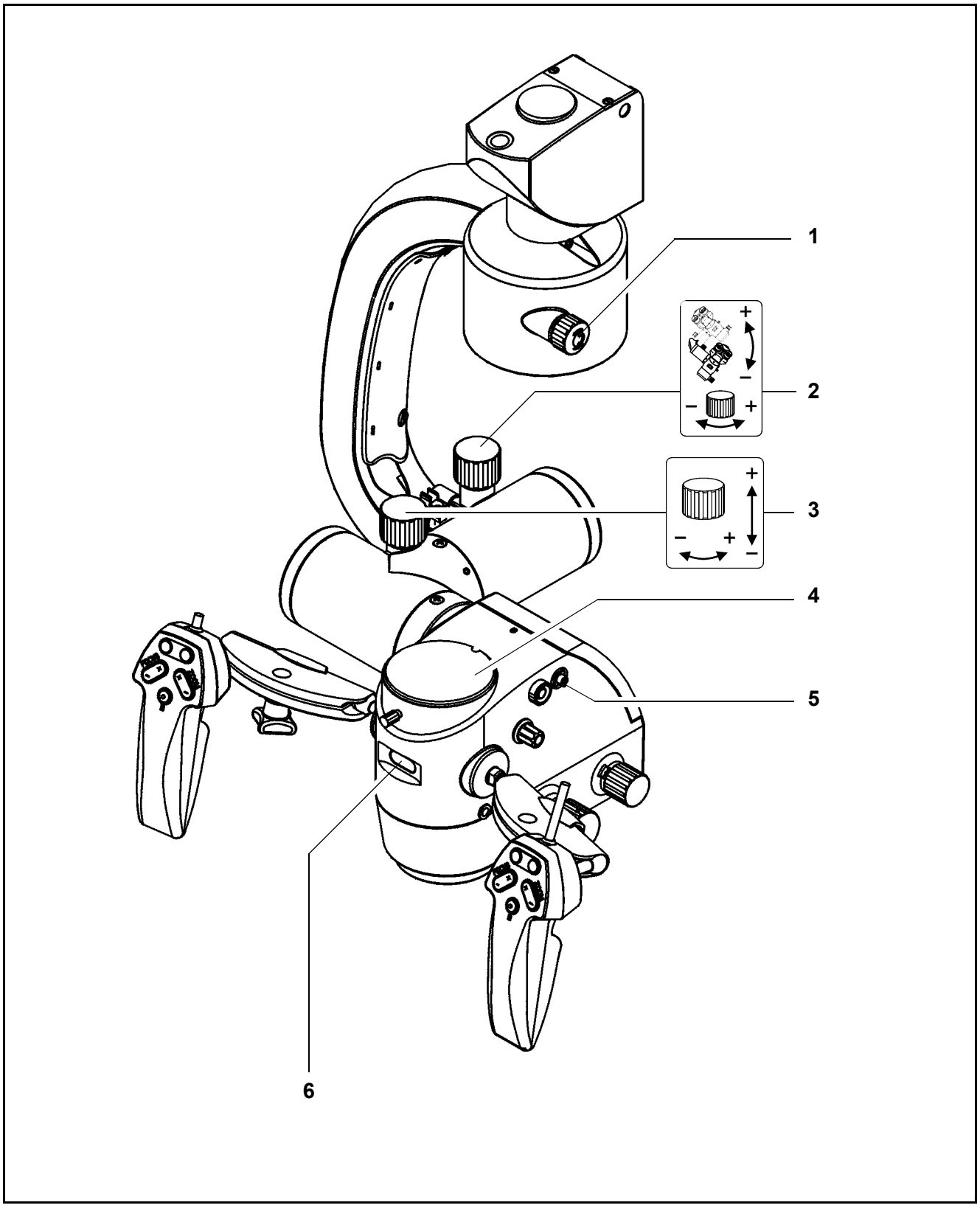
**2** Balance setting of the lateral tilt motion
Use this knob to adjust the balance setting of the lateral tilt motion.

**3** Balance setting of the front-to-back tilt motion
Use this knob to adjust the balance setting of the front-to-back tilt motion.

**4** Dust cover

**5** Mouth switch socket
You can use the mouth switch to release or lock the magnetic brakes of the suspension system used.

**6** Display window
for reading off the magnification factor $\gamma$ of the zoom system.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**7** Focus stop button
This button permits you to deactivate the electrical drive of the focusing system. After you have pressed the focus stop button, you can only focus manually on the surgical field using knob (9). The focus stop button is lit. To release the stop, press the focus stop button again (light in the button goes out).

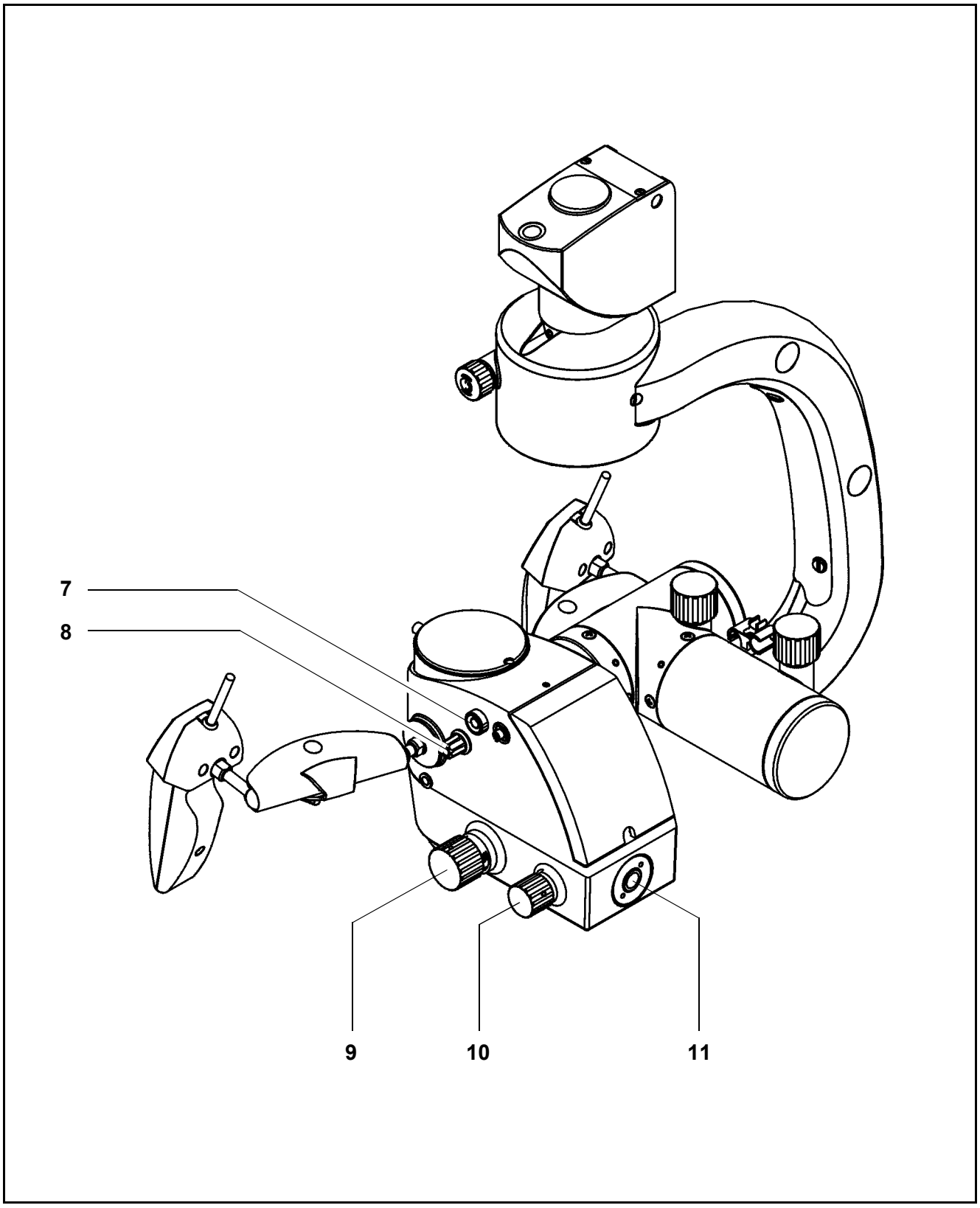
The use of a micromanipulator for laser applications is described in the section "Surgical microscope with laser micromanipulator", page 123.

**8** Zoom knob
Use this knob for manual setting of the magnification.

**9** Focusing knob
for manual setting of the image definition (focus, working distance)

**10** Illuminated-field knob
for manual setting of the illuminated-field diameter.

**11** Socket for S light guide
Insert the S light guide into the socket until it snaps in.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**12** Freely programmable release buttons
Specific functions of the suspension system can be assigned to these buttons, e. g.: increasing / reducing brightness etc.

**13** Zoom release button
for setting the magnification factor from 0.4x 2.4x.

**14** Focus release button
for continuous focusing within the working distance of 200 to 415 mm.

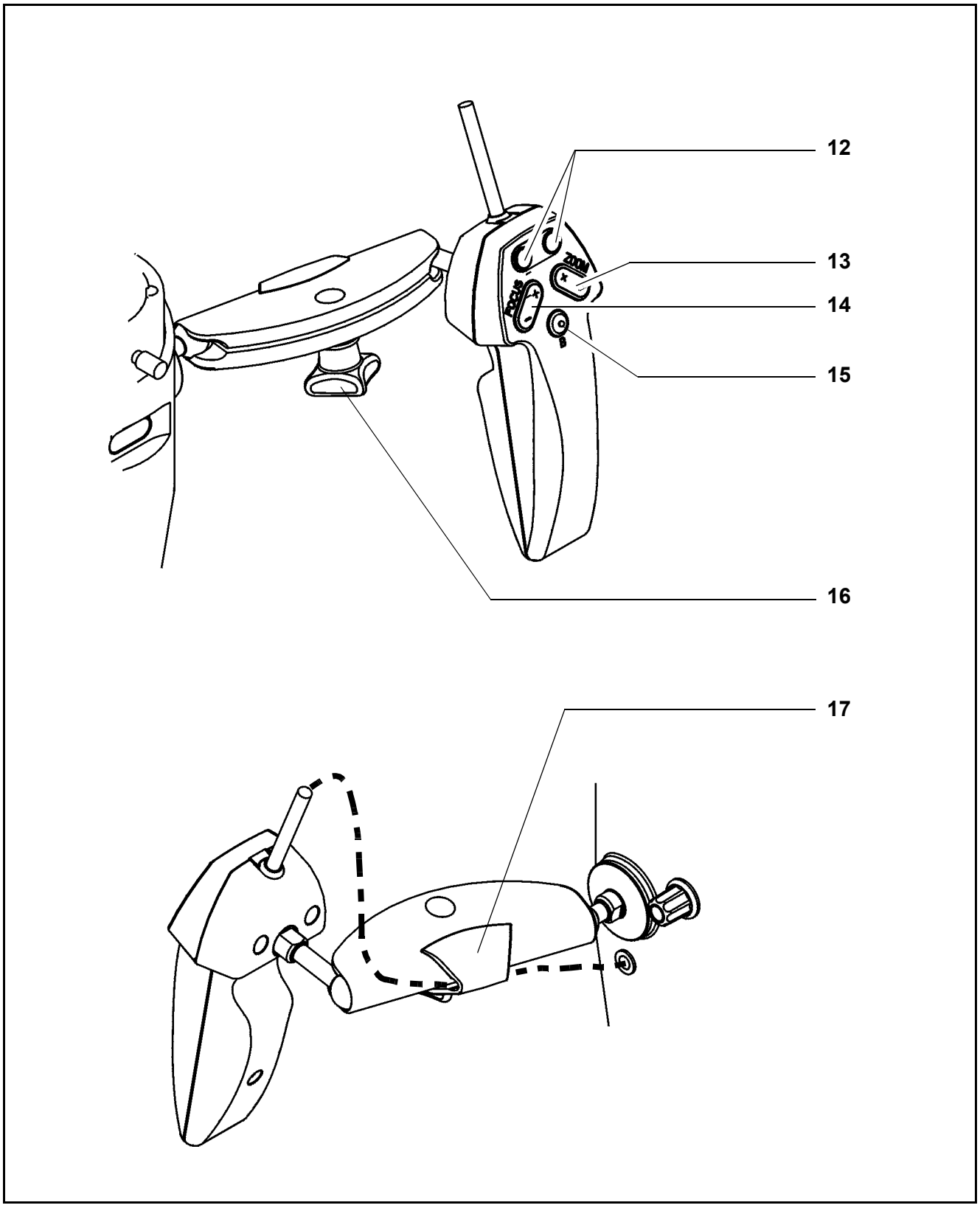
**15** Release button for magnetic brakes
The magnetic brakes of the surgical microscope and suspension system are released for as long as you press this button.

**16** Locking the handgrips in position
Using this screw, you can lock each handgrip in almost any position. You can swing the handgrips backward by 180° to permit a second surgeon to operate the microscope in the 180° position.

**17** Cable holder

**Warning!**

To permit almost effortless guidance of the surgical microscope, the microscope and the floor stand must be correctly balanced.
If the system is in an extremely unbalanced state, the unit can move uncontrollably out of position. For this reason, hold the surgical microscope tightly at its handgrips before unlocking the magnetic brakes.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### X-Y coupling (option)

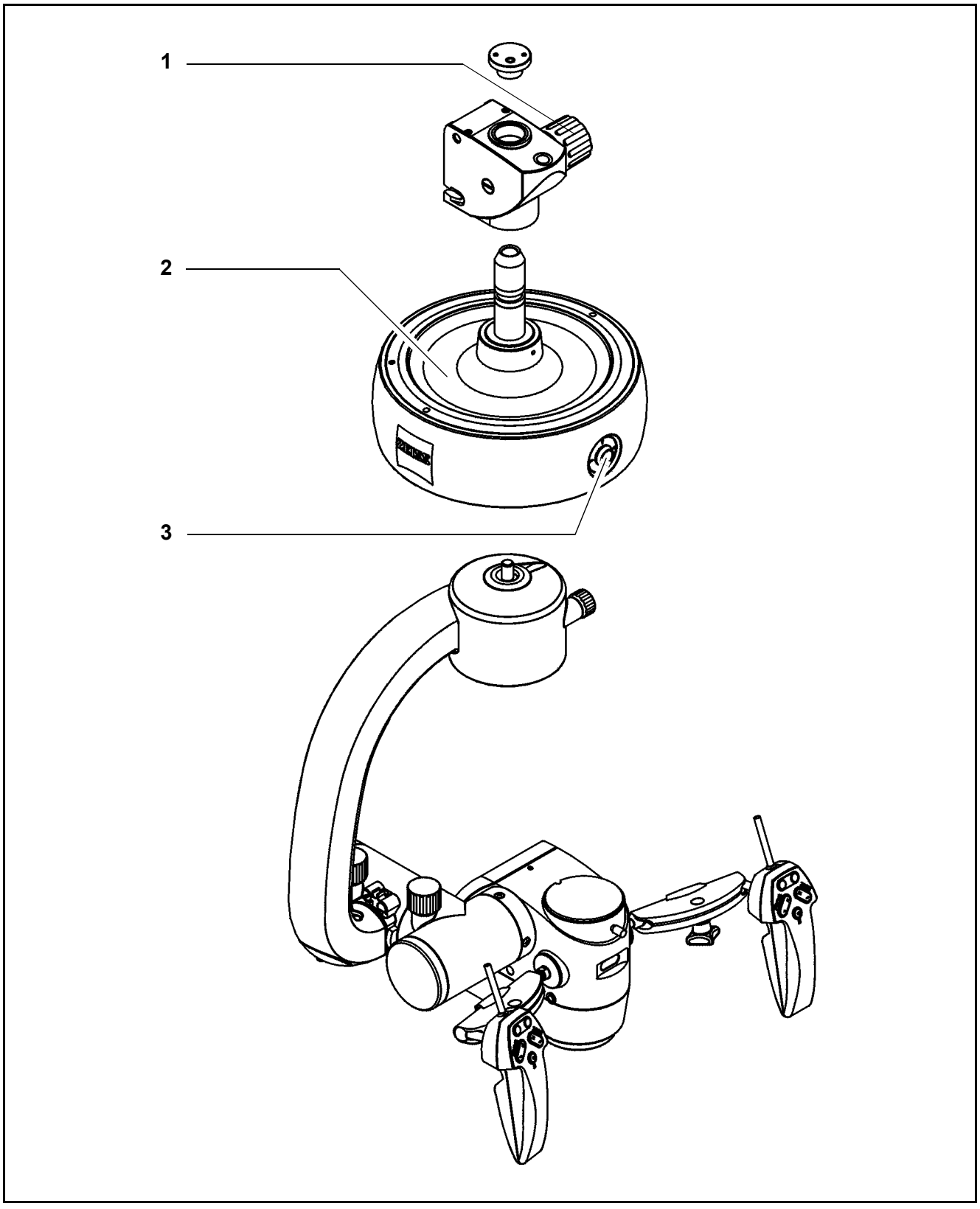
Note:

- The OPMI® VARIO can be equipped (and also retrofitted) with an X-Y coupling (2). Our service team or an authorized person will install the X-Y coupling for you.

The X-Y coupling allows motorized fine positioning of the surgical microscope in a horizontal plane. The range of travel is 40 mm x 40 mm. The speed of travel can be set on the display field of the suspension system. The X-Y coupling is provided with a recentering mechanism. When you press button (3), the X-Y coupling moves back into its center position. You can also trigger the recentering function using the freely programmable buttons on the handgrips or foot control panel.

Knob (1) permits you to adjust the friction of the microscope's rotary axis.

See also: Preparations for use / Aligning the X-Y coupling, page 108.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## Binocular tubes and eyepieces

### 180° tiltable tube

**1** PD adjustment knob
The correct position has been reached when the two eyepiece images merge into one. You can read off the interpupillary distance set on the adjustment knob.

**2** 180° tiltable tube

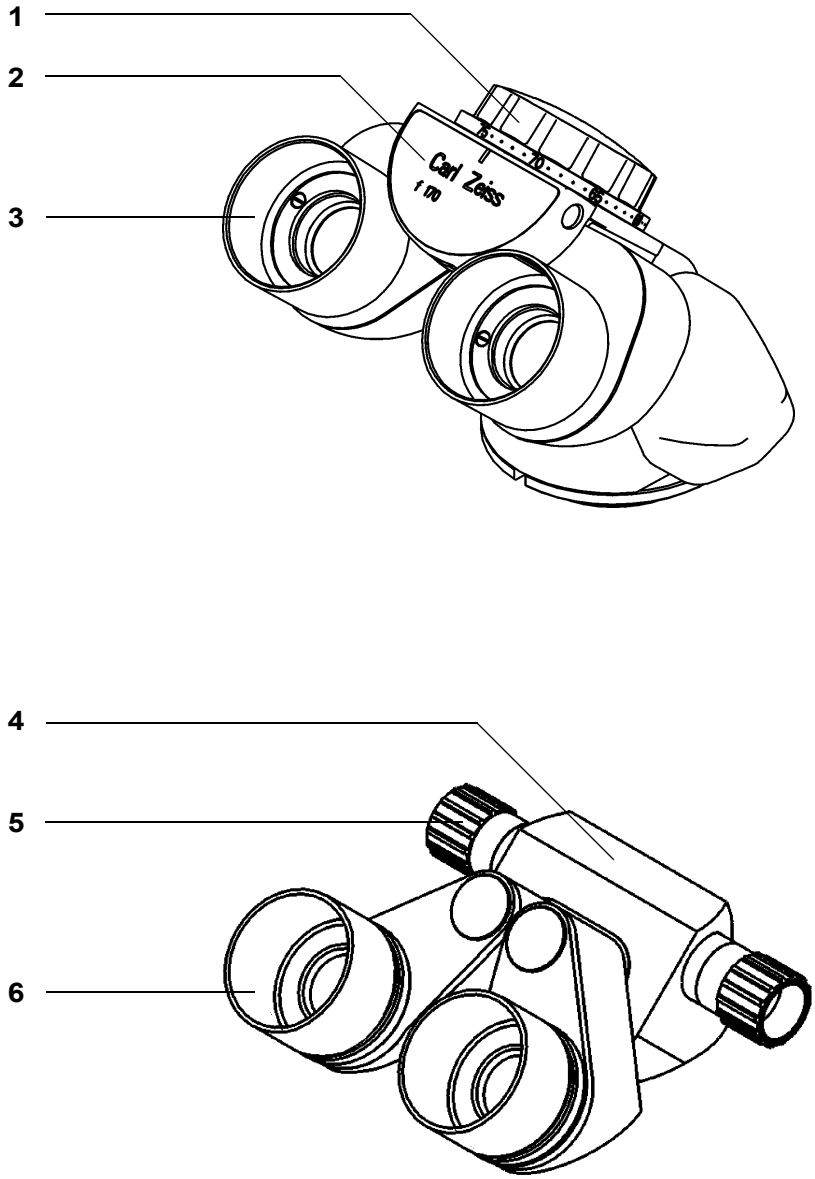
**3** Eyepiece mount

### 45° inclined tube

**4** 45° inclined tube

**5** PD adjustment knob
The correct position has been reached when the two eyepiece images merge into one. You can read off the interpupillary distance set on the adjustment knob.

**6** Eyepiece mount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**Widefield eyepieces with magnetic coupling**

Note:
When you remove these eyepieces from the tube, please note that they are fitted with a magnetic coupling. When mounted, the eyepieces display a very weak magnetic field, so that the usual rules for the handling of magnets must only be observed with eyepieces which have not been mounted on the microscope:

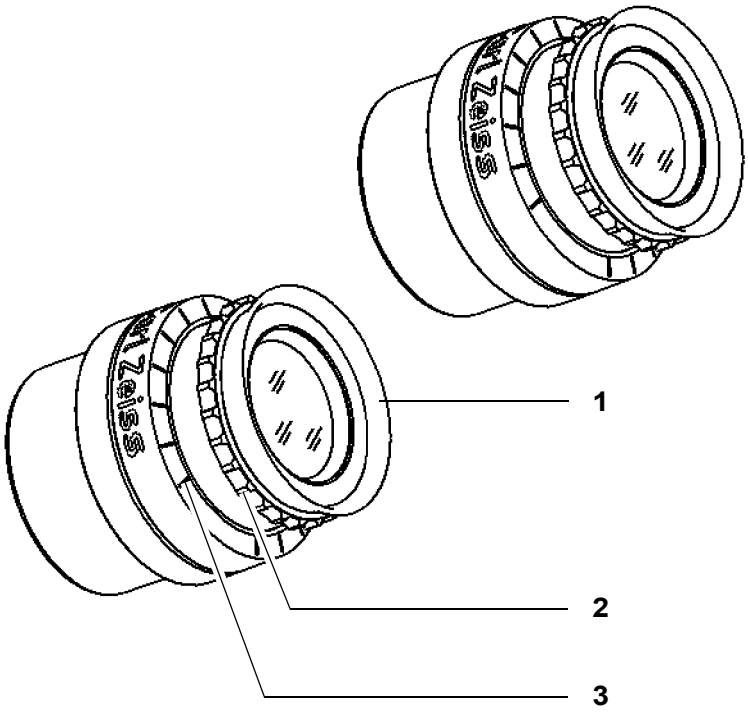
- Do not place the eyepieces close to instruments where there is any risk of magnetization.
- Do not place the eyepieces on sensitive electronic units such as infusion pumps, cardiac pace-makers, measuring instruments or magnetic data carriers such as disks, audiotapes and videotapes, or credit cards.
- Always store eyepieces not used in their original packaging.

**1** Eyecup
Always adjust the eyecups in such a way that you can see the full field of view.

  – Viewing with eyeglasses: Screw in the eyecups all the way.
  – Viewing without eyeglasses: Screw out the eyecups until you see the full field of view.

**2** Diopter adjustment ring
The eyepieces provide ametropia compensation between -8 D and +5 D. Eyeglass wearers who perform surgery wearing their glasses set the diopter adjustment ring to 0 D. Turn the ring until you have obtained the optimum setting. An integrated brake holds the ring in the position set.

**3** Diopter scale
for reading the prescription set.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## Retrolux illumination module

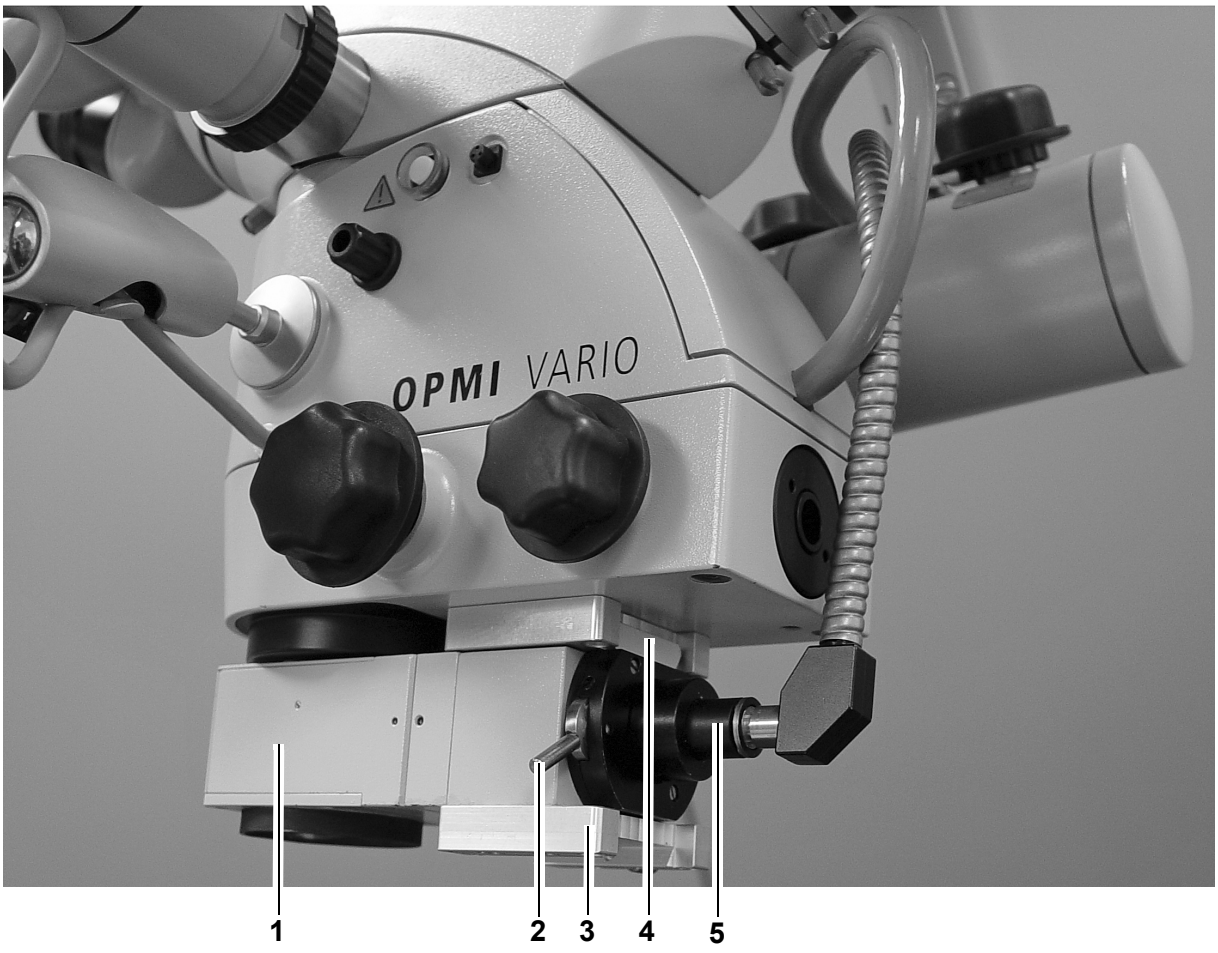
**1** Retrolux illumination module
enables the use of the OPMI Vario for ophthalmic procedures.

**2** Switch for swinging the retinal protection device into position
prevents light entering the patient's eye and therefore offers additional protection against phototoxic injury.

**3** Dovetail
for the attachment of a fundus imaging system.

**4** Dovetail
for the attachment of the Retrolux illumination module

**5** Light guide connector
for the attachment of the light guide.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# Components of the S88 floor stand

The S88 floor stand is a carrier system for the surgical microscope. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the floor stand are its superb mobility and easy operation. Four steerable casters on the stand base permit easy positioning in the OR. The motorized functions of the surgical microscope can be activated using a foot control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- user-defined basic settings for a maximum of nine users:
  - speeds for focus, zoom and X-Y coupling
  - and configurable buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out, triggering an AUX signal.

**Warning!**
The use of OPMI Vario for ophthalmic procedures is only permissible in combination with the Retrolux illumination module.

## Description of the modules

The floor stand comprises an articulated arm, a stand column and a stand base. The articulated arm comprises a carrier arm and a suspension arm. The carrier arm contains the control unit with all electrical supply systems required for the control of a motorized surgical microscope. These motorized functions can be activated using a foot control panel.
The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.
A maneuvering handle attached to the stand column is used to move the stand and to attach the foot control panel. The stand column is provided on its left and right with cable supports for winding up cables before the unit is relocated. Four steerable casters on the stand base permit easy positioning near the operating table. The stand base has been designed in such a way that high stability is ensured even with unfavorable loading of the stand. A locking pedal is provided to lock the floor stand quickly and reliably into position.

**Caution:**

As the stand is very easy to maneuver, there is a tendency to underestimate its considerable weight. Therefore, move the stand slowly and carefully!

## Design

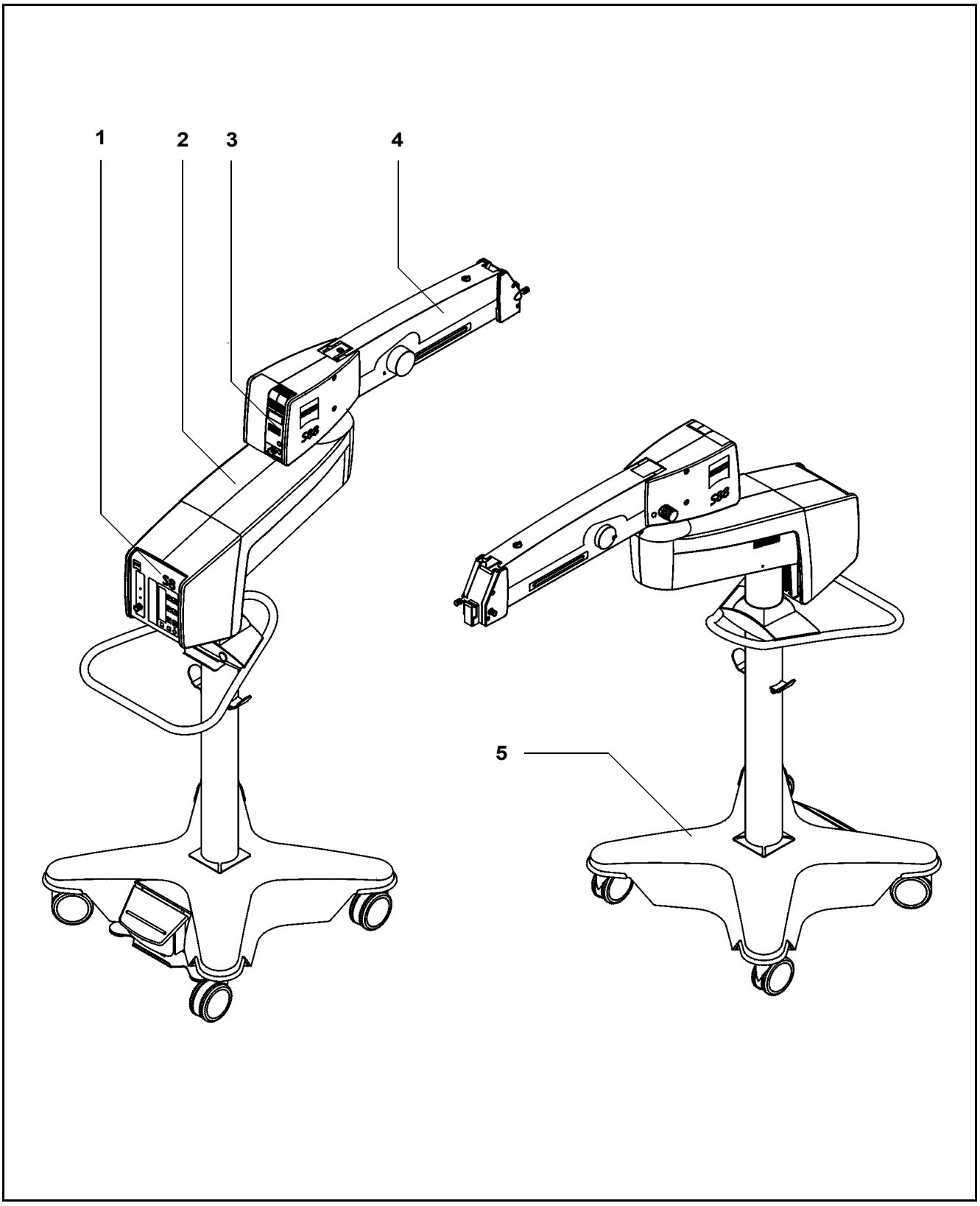
**1** Control panel

**2** Carrier arm

**3** Xenon illumination system, see page 62

**4** Suspension arm

**5** Stand base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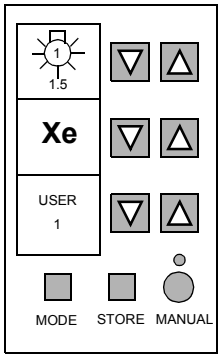
# Display field with control keys

Basic mode




The display and control panel is integrated in the control unit.

The surgical microscope on the suspension system can be controlled either manually or electronically. The control software required for electronic control is installed in the electronics box of the suspension system. You operate the software via the control and display panel, where you can read off and reconfigure the current settings.

The control and display panel is structured as follows:

– Three display fields (LCD) with the associated keys "∇" and "Δ".

– One row of keys comprising the MODE, STORE and MANUAL keys, and a yellow LED above the MANUAL key.

### User interface

The user interface of the suspension system comprises three display fields and keys located beside and below them.
A pair of keys "∇" and "Δ" has been assigned to every display field for making the appropriate settings.

The control functions have been combined in several modes (menu pages). The basic mode is always displayed in the normal operating status.

The following is displayed in the basic mode:

– the current lamp brightness of lamp 1 (xenon) in the upper display field,

– Xe for xenon in the middle display field,

– the current user ID in the lower display field.

### Key row

Three keys and an LED are provided below the display fields.
Use the "MODE", "STORE" and "MANUAL" keys to select the different control functions (modes).

"MODE" key and "STORE" key
The "MODE" and "STORE" keys permit you to access the different modes of the user interface. For details, please see the chapter "Operation".

"STORE" key
Use the "STORE" key to save the current focus and zoom settings.

"MANUAL" key
The "MANUAL" key permits you to switch to manual operation. For details, please see the chapter "Operation".

Yellow LED above the "MANUAL" key
The yellow LED is lit when you have switched to the manual mode.

## Lamp housing with xenon light source

**Warning!**
The use of OPMI Vario for ophthalmic procedures is only permissible in combination with the Retrolux illumination module.

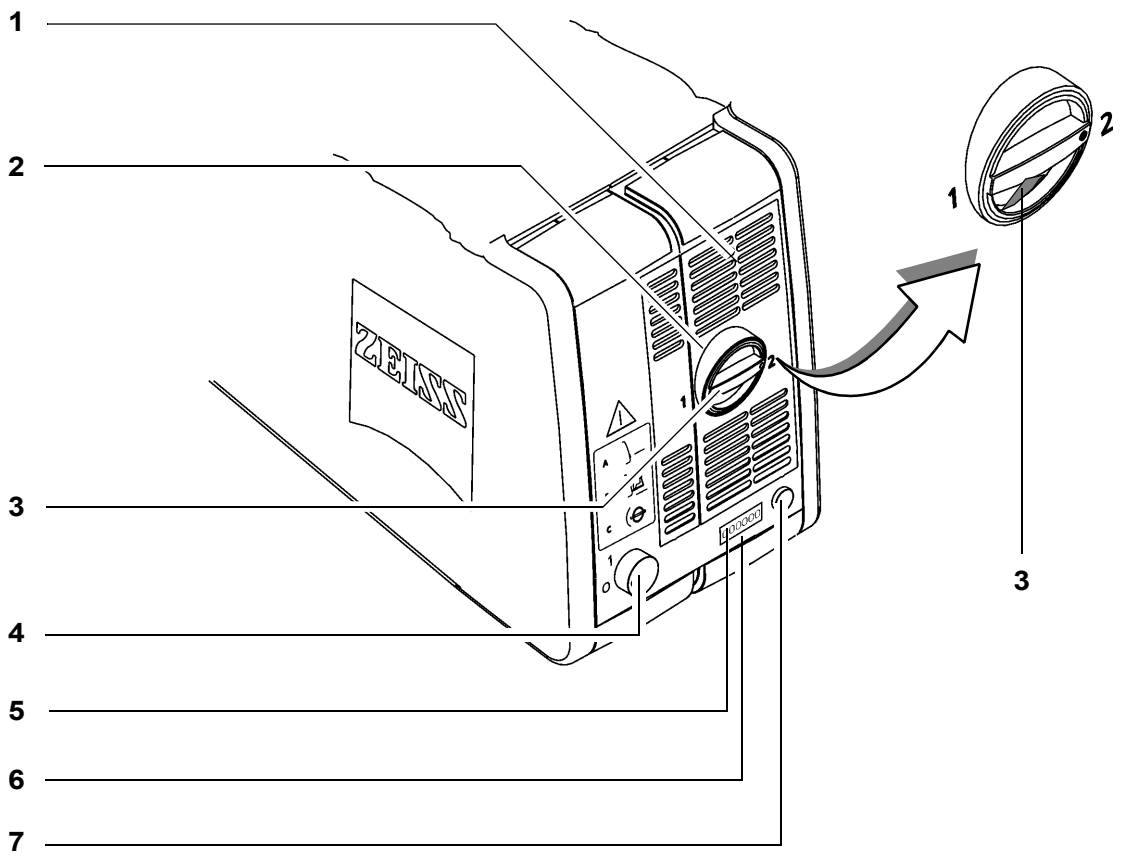
The suspension system is equipped with a xenon illumination system for fiber illumination. The xenon lamp generates light whose spectrum resembles that of natural daylight. Regardless of the brightness setting, the color temperature of the light always remains the same. Normal daylight film without any additional conversion filters can therefore be used for photographic documentation. The lamp housing contains two xenon lamps. The second lamp is used as a backup lamp which must be swung into the illumination beam path should the first lamp fail.

Ventilation grid
Do not cover the ventilation grid! For example, drapes could be covering the grid. This can cause the lamp modules to overheat and lead to lamp failure.

**1** Lamp module

**2** Manual activation of the backup bulb

- If the xenon bulb fails, open the lamp module as follows: Press button (7). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (2) 180° until it snaps in place. This moves the backup bulb into the illumination beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset service hour counter (5) to "0". Use a pointed object and press it into the recess of reset button (6).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Note:
When inserting a new lamp module, make sure that the knob (2) is set to "1“. If the first lamp fails, switch to the second lamp in logical sequence.

**3** Indicator: backup lamp is in use
When the red segment in the knob (2) lights up, the backup lamp is in use.

**4** Filter selector knob
The filter knob has two positions:

0 No filter

1 Filter swung in
(No integrated filter in the standard configuration)

**5** Counter
The counter records the service hours of the xenon light source.

- Change the xenon lamps after about 500 hours of operation to prevent them from exploding. Then reset the counter to "0" by pressing reset button (6).

**6** Reset button
The reset button resets the service hour counter to "0".

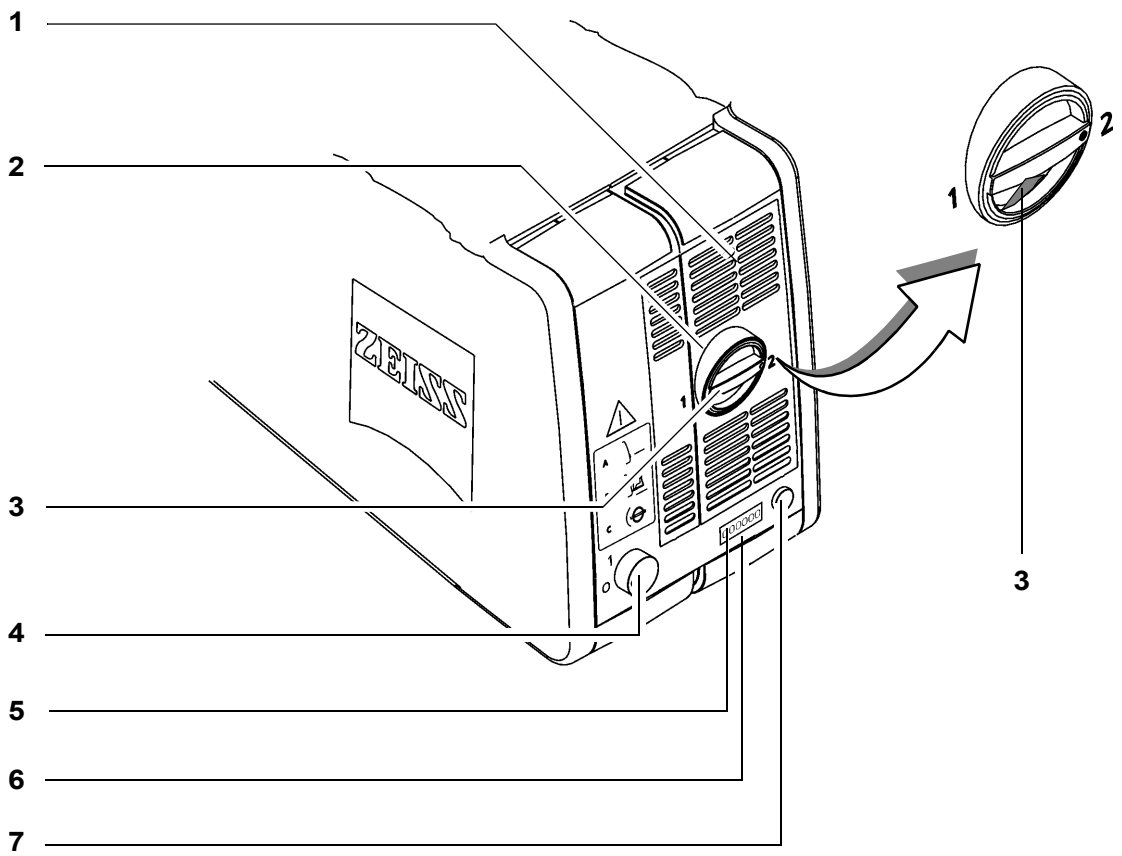
**7** Opening the lamp module
When you press this button, the lamp module is slightly ejected.

- To change the lamp, pull out the lamp module as far as it will go. Turn the knob (2) through 180° until it snaps in place. This moves the back-up lamp into the illumination beam path.

**Warning!**
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.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**8** Brightness control
You can adjust the brightness using the two control keys on the control panel.

Note:
The brightness of the xenon lamp can also be adjusted by pressing the appropriate buttons on the foot control panel.

**9** Yellow indicator lamp
Lights when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp goes out again.

Note:
If the first lamp has failed and the backup lamp is in use, make sure to have a backup lamp module ready at hand as a precaution.

**10** Green indicator lamp
Lights when the illumination has been switched on.

**11** Selector switch:

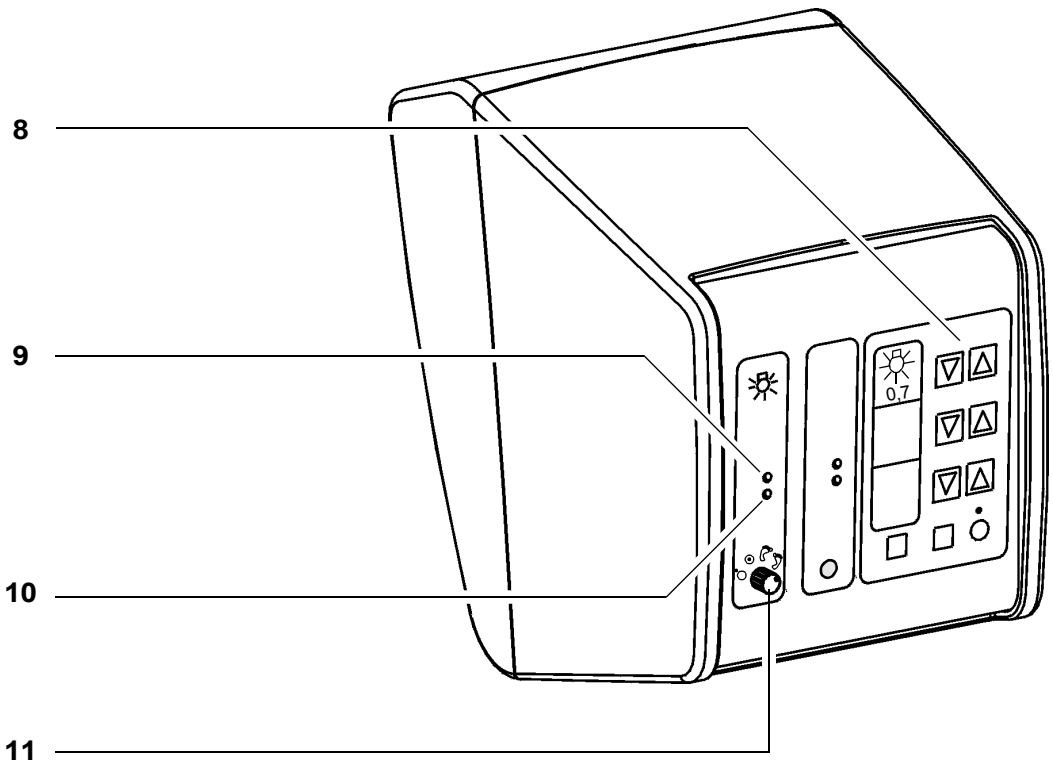
Illumination is off.

Illumination is on.

Illumination can be switched on/off on the **left-hand side** of the foot control panel.

Illumination can be switched on/off on the **right-hand side** of the foot control panel.

Note:
You can adjust the selector in such a way that you can switch the illumination on/off on the right-hand and left-hand sides of the foot control panel.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## Suspension arm

**1** Lock of the cable duct

- For opening, turn a quarter turn clockwise or counterclockwise.
- For closing, press down and turn a quarter turn clockwise or counterclockwise.

**2** Adjustment screw for limiting downward movement
Use this screw to set the minimum vertical working distance from the surgical field. Bring the surgical microscope into its working position. Turn the adjustment screw for limiting downward movement clockwise as far as it will go. Adjust the downward movement limitation before each surgical procedure.

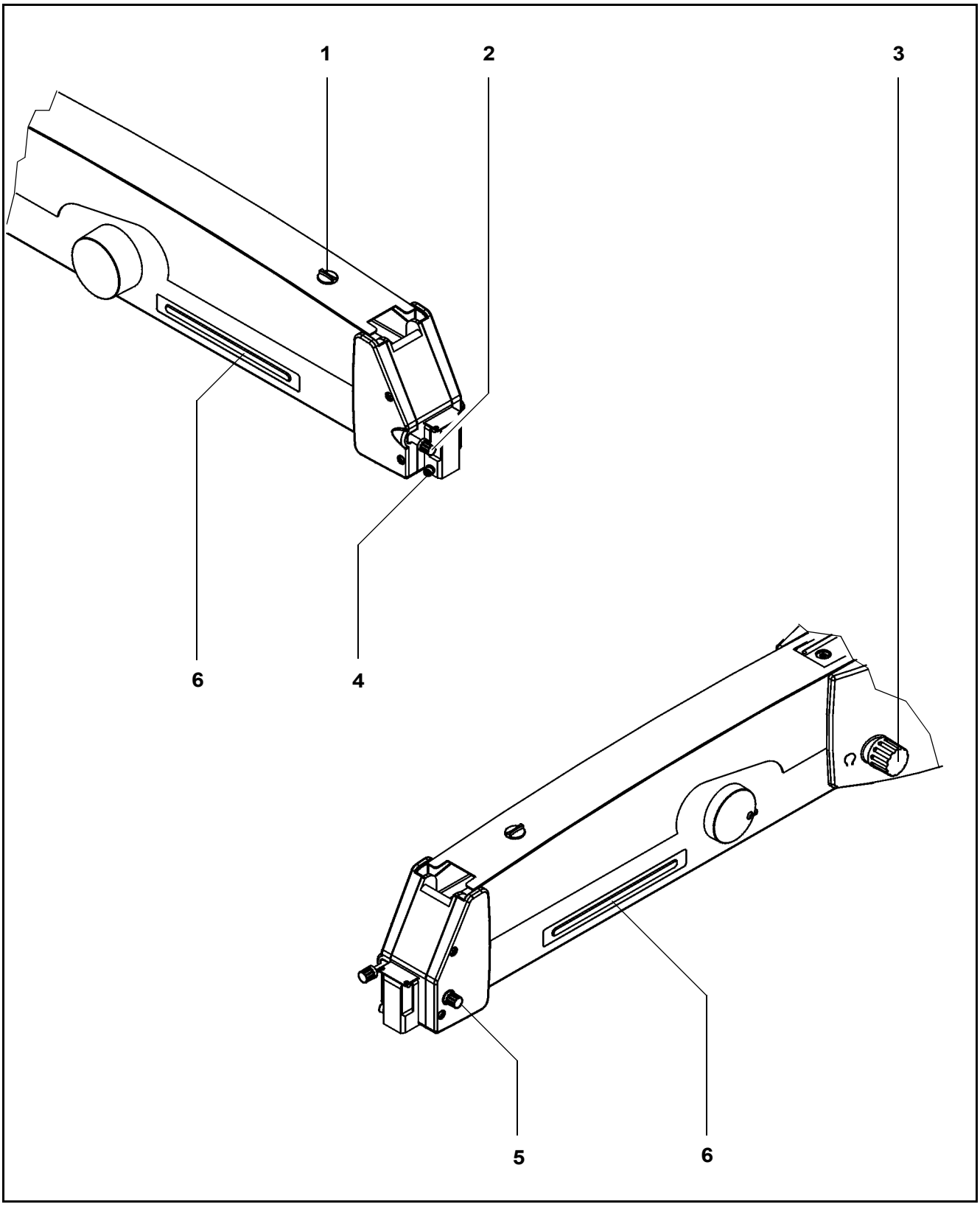
**3** Balance setting screw
After mounting the surgical microscope including all accessories, adjust the balance setting of the suspension arm using this screw. Balance setting is described in detail in chapter “Operation“.

**4** Securing screw
for securing the OPMI® coupling.

**5** Locking screw
for locking the suspension arm in a horizontal position for mounting the surgical microscope. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached.

**6** Release bar
Allows non-sterile persons to unlock the magnetic brakes of the suspension system.

Magnetic brake release buttons
The magnetic brake release buttons are located on the surgical microscope. For as long as you press one of these buttons, you can move the articulated arm in all directions. When you let go of the button, the magnetic brakes will lock all axes in position at the same time.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## Stand base with column

**1** Handle
for moving the stand.

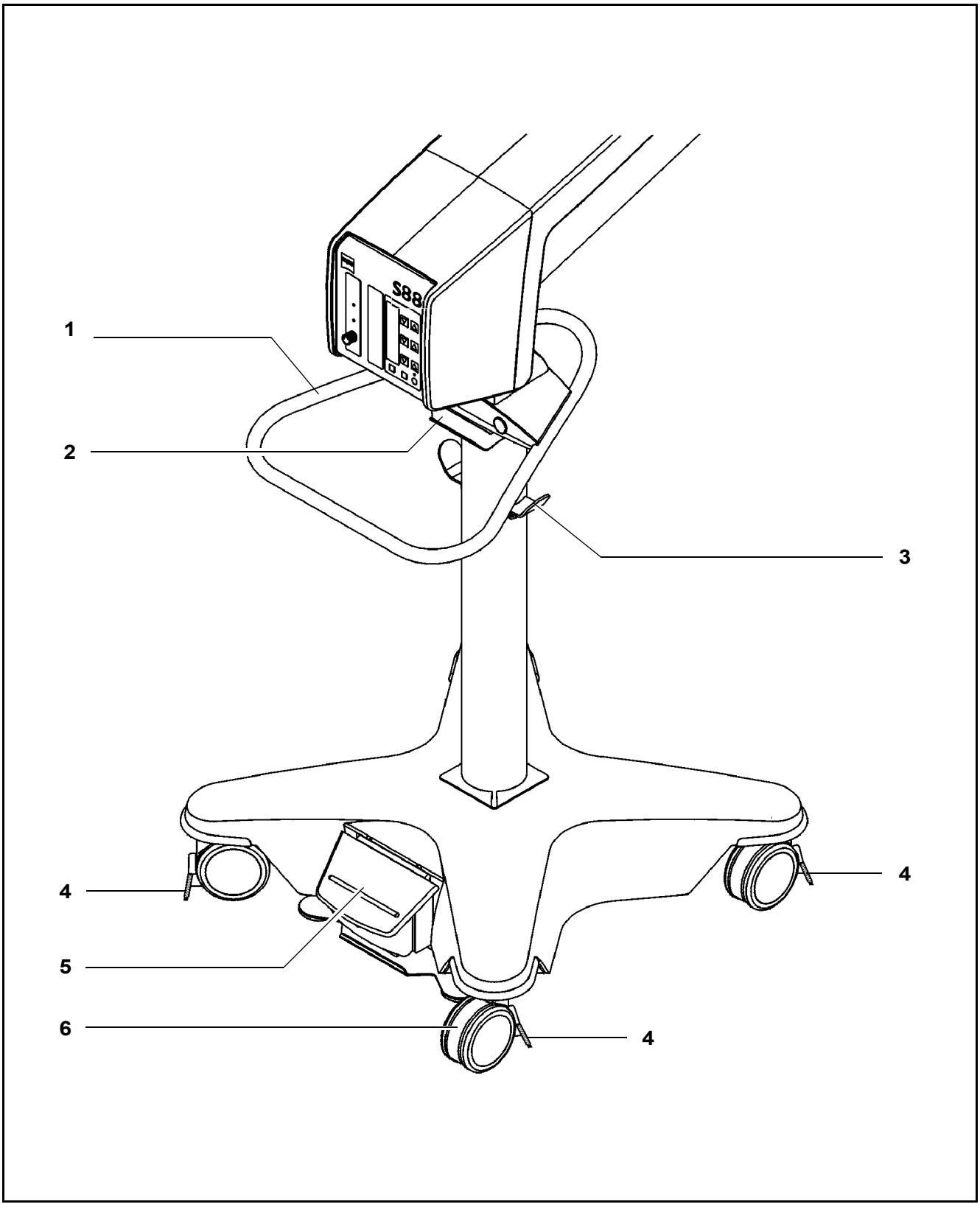
**2** Support
for hanging up the foot control panel during transport.

**3** Cable support (2x)
for winding up the power cord and the cable of the foot control panel.

**4** Cable deflectors
are provided to prevent cables on the floor from being run over and damaged.

**5** Locking pedal
Press once to lock the stand in position.
Press a second time to release the locking pedal.

**6** Steerable casters
The four steerable casters on the stand base permit easy positioning in the OR.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## Connector panel

**1** Remote control socket
for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.

**2** Connector for switching component
Connection possibility for: a foot control panel, a hand control panel or an operating chair with an appropriate foot switch.

**3** Potential equalization bolt

**4** Indicator window for rated voltage
The voltage shown here must correspond to the rated line voltage provided on the site of installation. You can adjust the sliding switch using a suitable tool.

**Warning!**
Please observe the maximum current consumption of two power outlets (4) and (5). Only connect medical devices approved by us to outlets (4) and (5). When using other instruments, make sure that safety is guaranteed regarding admissible ground leakage currents. The admissible limit value of the ground leakage current present in the suspension system's power cord must not exceed 500 µA in compliance with EN60601-1/IEC 60601-1. CSA/US certification in compliance with UL 60601-1 only allows a maximum ground leakage current of 300 µA.

**5** Power outlet socket
for medical devices with a maximum current consumption of 2 A.

Note:
The current of this power outlet is switched on/off using power switch S2 (7).

**6** Power outlet socket
for medical devices with a maximum current consumption of 5 A.

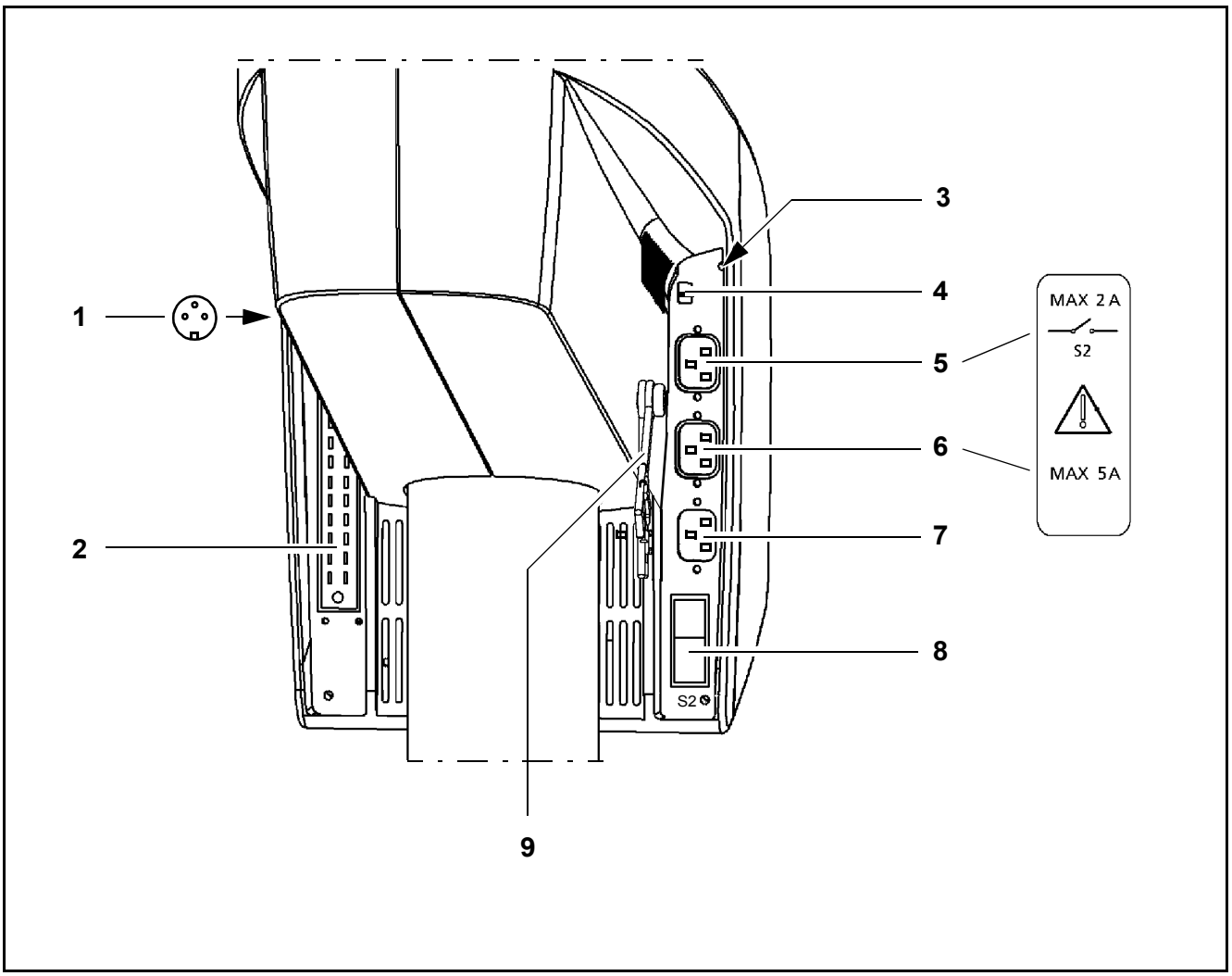
**7** Power inlet socket

**8** Power switch S2
When the stand is on, the green indicator light in the switch is lit.

**9** Strain relief device
The strain relief device prevents inadvertent unplugging of the following electrical connections:

– power cable,

– connecting cable for foot control panel, hand control panel or operating chair with appropriate footswitch.



## Instrument tray (option)

The S88 floor stand can be equipped or retrofitted with an instrument tray (1). In the case of retrofitting, our service staff or an authorized person will install the instrument tray on your suspension system.

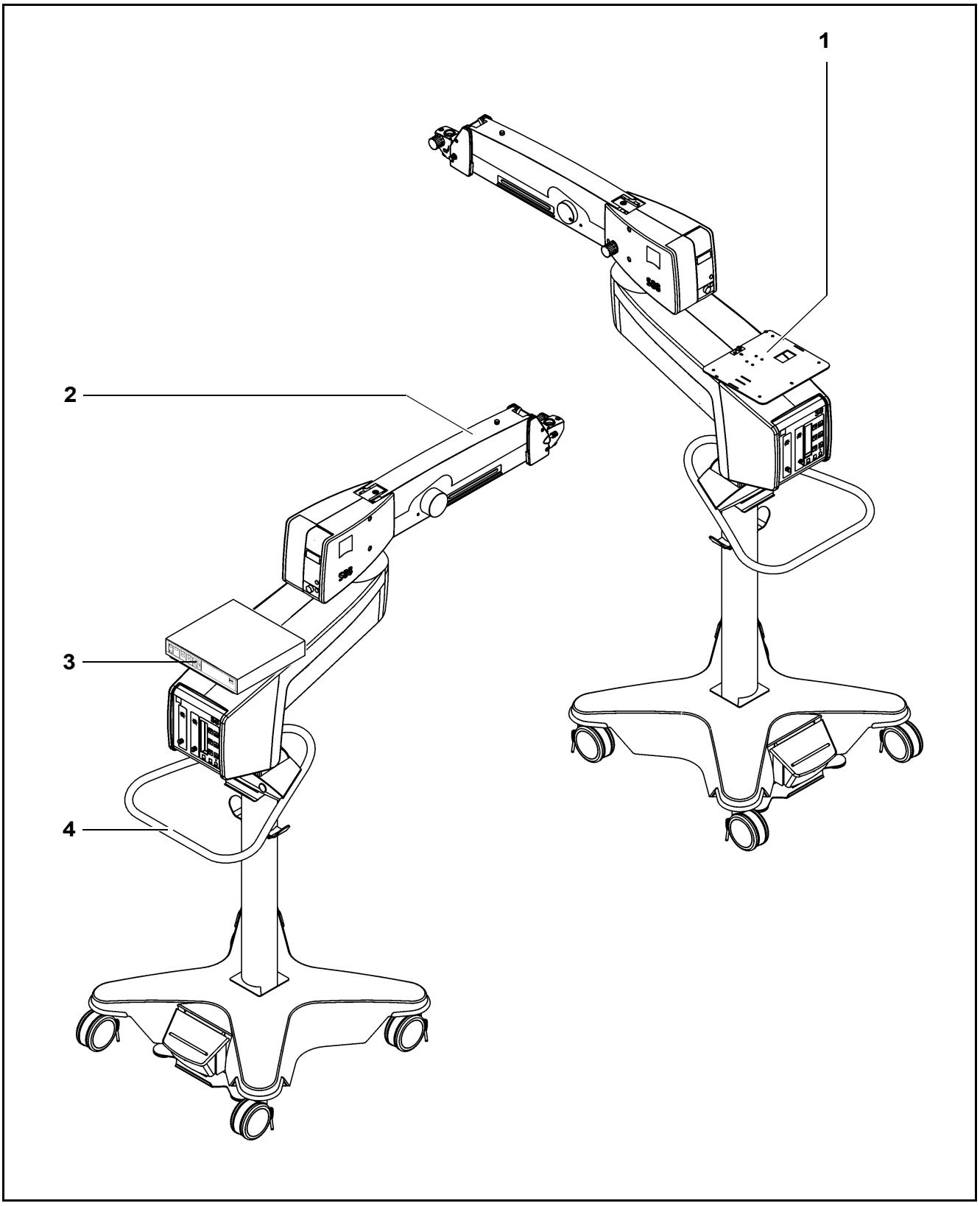
The instrument tray (1) can carry a maximum load of 13 kg. The tray has been designed, for example, for mounting MediLive Trio from Zeiss:

MediLive Trio is attached to the instrument tray with the aid of two stud bolts. (The four receptacles supplied with the instrument tray are not required for mounting MediLive Trio.)

A second MediLiveTrio or other accessory equipment can be mounted on the instrument tray using the strap provided. Please note the instrument tray's maximum load capacity of 13 kg.

**Warning!**

- Make sure that the accessory equipment is positioned as securely as possible on the instrument tray.
- Mount MediLive Trio on the instrument tray using the two stud bolts.
- If required, secure further accessory equipment on the tray using the strap provided.
- Do not place a load of more than 13 kg on instrument tray (1).
- Remember there is a risk of collision and crushing when suspension arm (2) is folded to its moving position. A "Risk of crushing" warning label is therefore attached on the left and right of suspension arm (2).
- Please read the relevant user manual before starting up the accessory equipment.
- Never pull or push at the accessory equipment (3) in order to move the S88 floor stand. Always use handle (4) to move the S88 floor stand.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## Video monitor (option)

The S88 floor stand can be equipped or retrofitted with a TFT monitor (1). In the case of retrofitting, our service staff or an authorized person will install the TFT monitor on your suspension system.

The TFT monitor (1) features a 15" screen and permits the scrub nurse and other OR staff to follow the surgical procedure. For optimum viewing, the TFT monitor can be precisely positioned using flexible arm (2).

**Warning!**
Risk of injury due to lowering of the TFT monitor!

- Ageing processes may lead to the loss of gas in the gas pressure spring of the monitor's suspension arm, causing the TFT monitor to move downward of its own accord.
- Compensate for the loss of gas by readjusting the gas pressure spring as described on page 180.

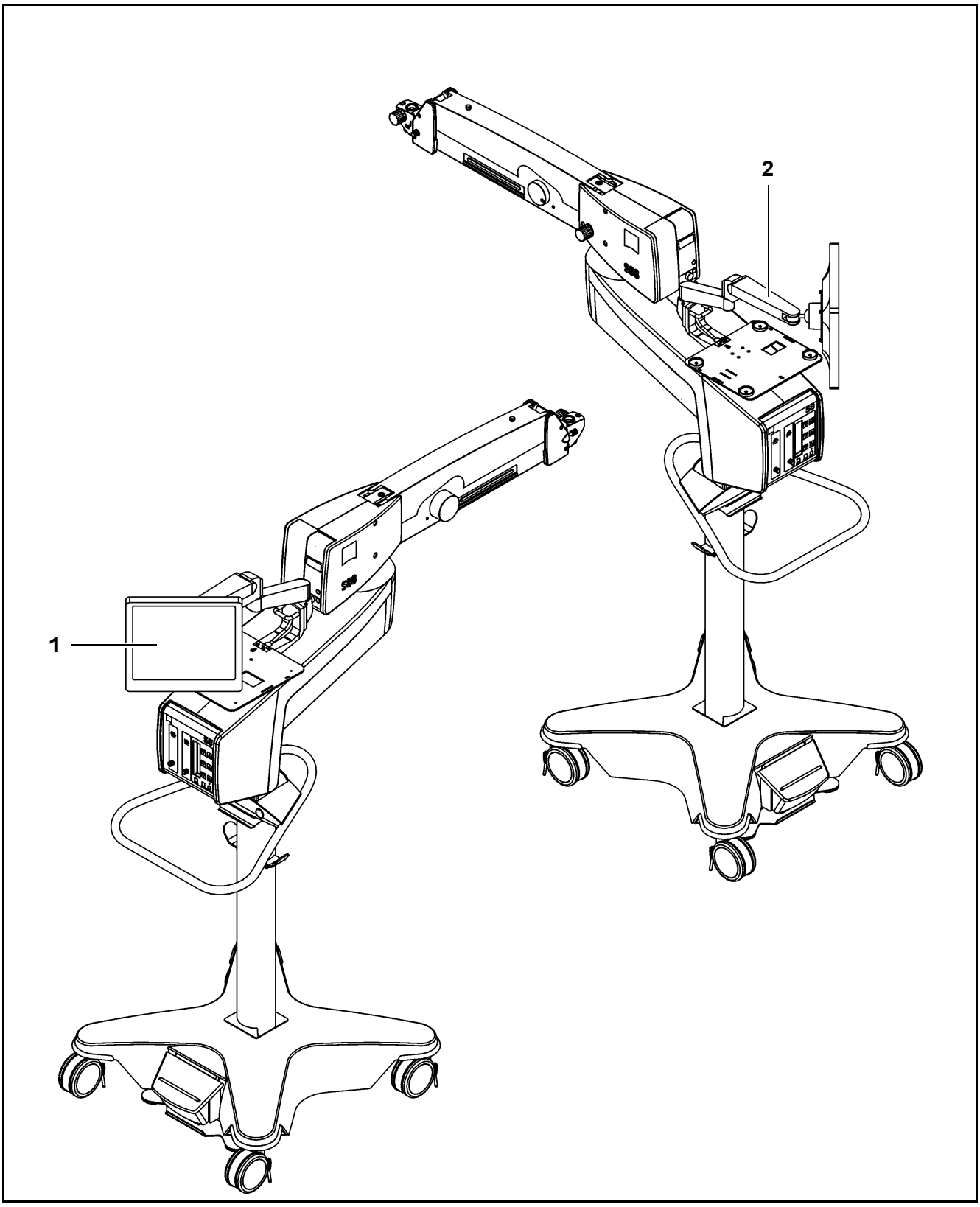
If the TFT monitor continues to move downward, the gas pressure spring is defective.

- Notify our service representative.

**Warning!**
Do not use the stored video sequences, video clips (cut sequences) and single images for diagnostic purposes, as the video cameras and the monitor have not been calibrated. The visualized images may therefore include deviations in scale, color and shape.

This applies in particular if the sequences, clips or images are viewed on a monitor outside the OR, as the transmission to a different monitor may lead to changes in the display.

Note:
The background illumination of the LCD display has a limited service life. If you notice that the display is getting darker or starts to flicker, contact your Zeiss dealer.


1
2

### Components

The principal component of the TFT monitor is the 15" screen which delivers flawless, sharp images even at low frame rates of 50 Hz.

The connectors and controls are located under cable cover (2) on the back of the TFT monitor. To access the connectors and controls, proceed as follows:

- Remove two screws (3) from cable cover (2) by turning them counterclockwise.
- Remove cable cover (2) by pushing it upward.

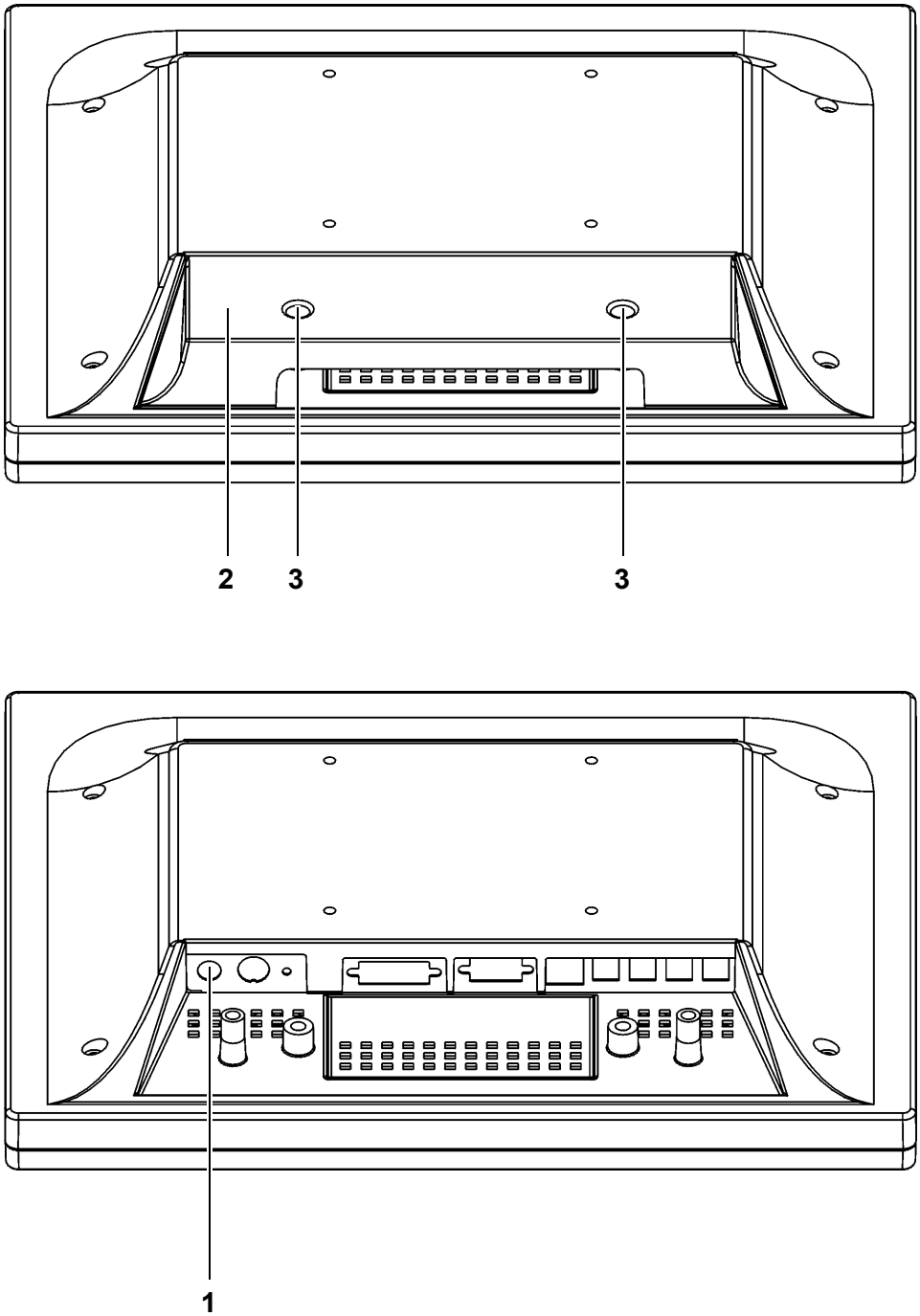
### Controls

**1** Auto Adjust button
The Auto Adjust function permits automatic image adjustment of the TFT monitor to obtain a sharp, optimally positioned image. Perform the automatic adjustment when initially starting up the TFT monitor or after making any changes to the system.

Note:

– The Auto Adjust function can only be executed if a VGA signal source is connected.

– Always use a normal camera image for automatic image adjustment. Do not use the test image which is displayed directly after power-on or when no camera head is connected.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1

**Connector panel**

**2** Power supply
for power and voltage supply of the device.

**Caution:**
Only operate the device with the power cable included in the delivery package.

**3** DVI connector
DVI stands for Digital Video Interface and is the latest technology for digital data transmission. The cable length for this connector must not exceed 4.5 m.

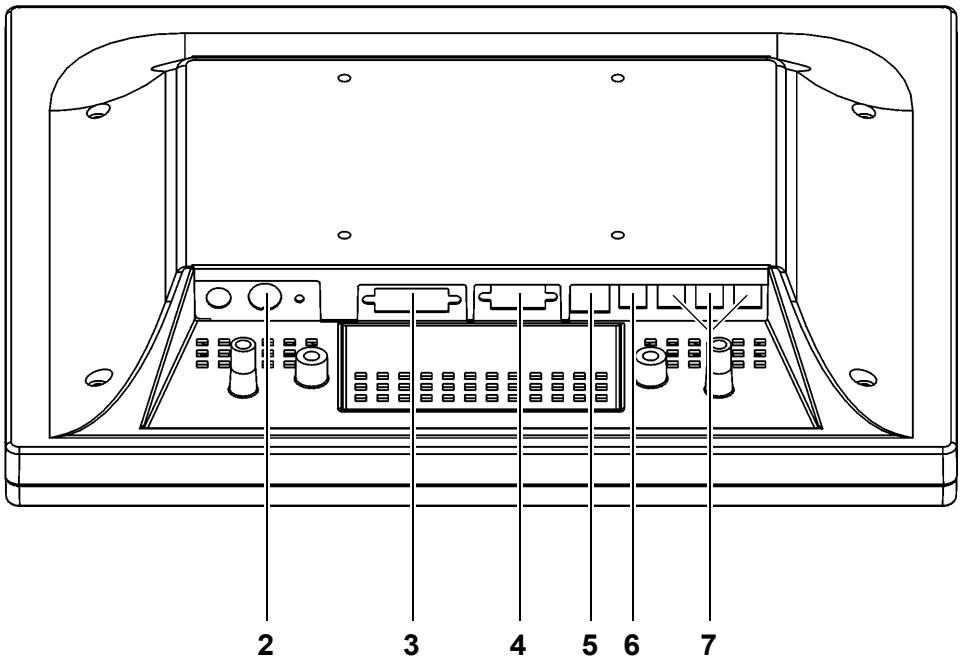
Note:
We recommend the DVI connector for the connection of a camera, as it delivers optimum image quality with minimum flicker. The DVI cable is included in the delivery package.

**4** VGA connector
VGA stands for Video Graphics Array and is an analog interface for video data transmission between graphics cards and display devices.

**5** S-Video connector
S-Video - also known as separate video or Y/C - is an analog interface that transmits brightness and color information as separate signals. This standard provides higher video image quality than Composite Video. The maximum cable length for this connector should not exceed 10 m. For longer cables, please use the Composite Video connector.

**6** Composite Video connector (1x cinch)
This is an analog interface that transmits the composite video signal via a single channel (yellow cinch connector). This connector is particularly suitable for transmitting video signals over long distances.

**7** Component connector (3x cinch)
This is an analog interface that transmits the component video signal via three channels (red, yellow, green cinch connector). Each channel transmits one of the primary colors.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### Powering on the TFT monitor

To facilitate the operation of the TFT monitor, it is automatically activated when the suspension system is switched on.

During the power-on process, the TFT monitor executes a power-on sequence in which the signals on the connectors (DVI, VGA, S-Video, Composite and Component) are checked. After detection of the signal available, the correct screen resolution and frame rate are set automatically.

Note:
If a signal source is present at the VGA connector, the image settings can be optimized using the Auto Adjust function as described on page 78.

### Aligining the video monitor

The best visualization is obtained when you are looking straight at the screen of the TFT monitor.

- Swivel the monitor's carrier arm (1) and suspension arm (2) into the horizontal position required.

**Caution:**
Take care not to damage the video cable!
Do not swivel the suspension arm beyond ±120°.

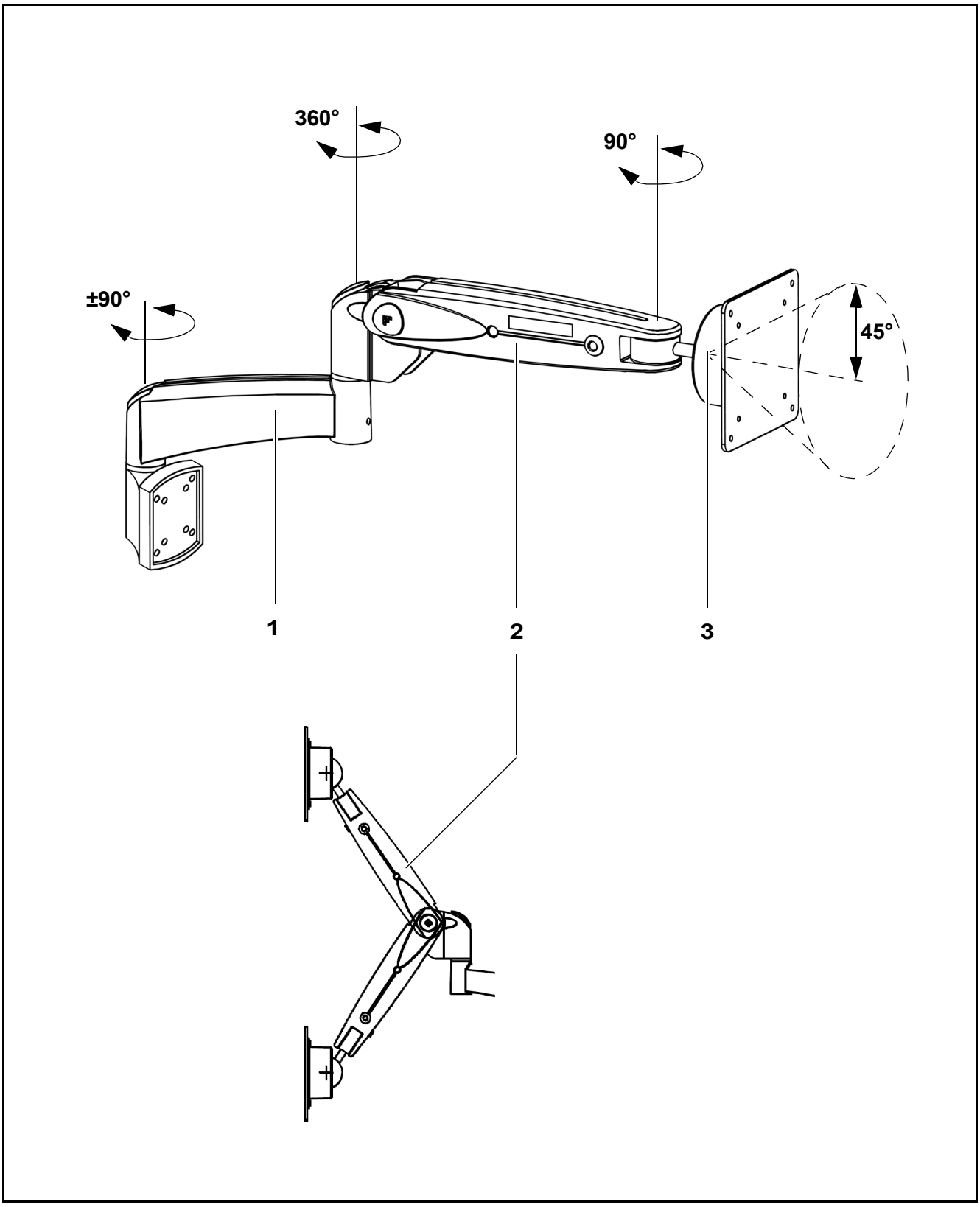
- Tilt the suspension arm (2) upward or downward until the required height has been reached.
- Hold the upper corners of the TFT monitor and adjust it to the required angle via ball joint (3).

**Warning!**
Risk of injury due to lowering of the TFT monitor!

- Ageing processes may lead to the loss of gas in the gas pressure spring of the monitor's suspension arm, causing the TFT monitor to move downward of its own accord.
- Compensate for the loss of gas by readjusting the gas pressure spring as described on page 180.

If the TFT monitor continues to move downward, the gas pressure spring is defective.

- Notify our service representative.


360°
90°
±90°
45°
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# Foot control panel (option)

## Intended use

The foot control panel permits you to operate various functions of a suspension system or surgical microscope. The assignment of functions to the controls on the foot control panel is described on the next page. Only functions provided in the system configuration used (suspension system, surgical microscope) can be controlled.

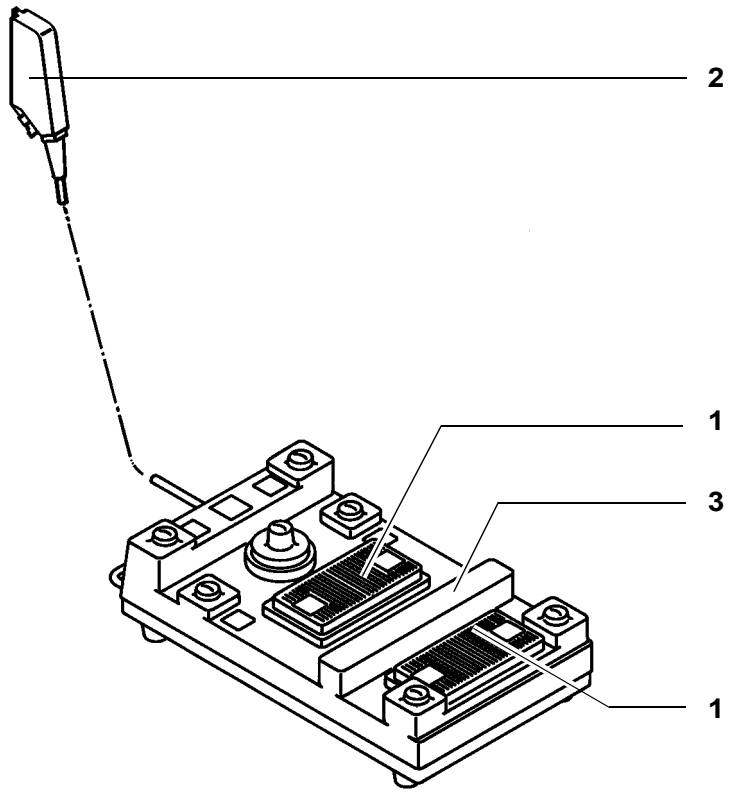
## Design

The 8-function and 14-function foot control panels feature two rocker switches (1) which are used to control the ”Zoom” and ”Focus” functions. The switches for these functions are located on one side, allowing you to control both directions of a function using toe/heel movement without having to shift your foot. Bridge (3) between two rocker switches (1) serves as a support to rest your foot on.

Connector (2) is used to connect the foot control panel to the appropriate connector on a suspension system or a wall-mounted control panel.

The foot control panel is provided with a waterproof rubber cover.

The illustration shows the 14-function foot control panel. Depending on the configuration involved, an 8-function foot control panel can also be connected.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## Foot control panel with 14 functions

The illustration shows the standard assignment of functions to the foot control panel with 14 functions. The focus/zoom assignment can be changed by our service staff, on request.

**1** Control of an X-Y coupling (if installed)

**2** Button A: Reducing the lamp brightness

**3** Button C: Function as assigned in configuration mode 1

**4** ZOOM ▼: Reducing magnification, increasing the field of view (alternatively FOCUS ▲: Increasing the working distance)

**5** ZOOM ▲: Increasing magnification, reducing the field of view

**6** Illumination on/off

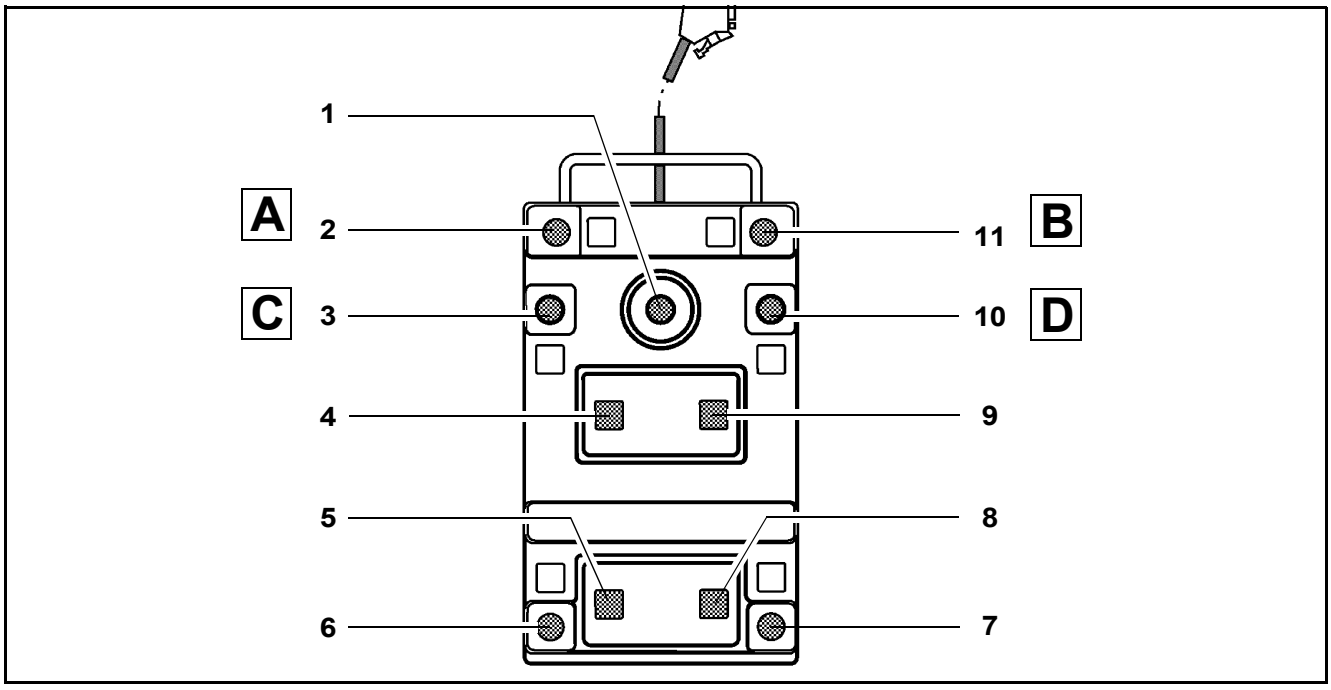
**7** Illumination on/off

**8** FOCUS ▲: Increasing the working distance (alternatively ZOOM ▼: Reducing magnification, increasing the field of view)

**9** FOCUS ▼: Reducing the working distance

**10** Button D: Function as assigned in configuration mode 1

**11** Button B: Increasing the lamp brightness



## Foot control panel with 8 functions

The illustration shows the standard assignment of functions to the foot control panel with 8 functions.
The focus/zoom assignment can be changed by our service staff, on request.

**1** Reducing the lamp brightness

**2** No function

**3** ZOOM ▼: Reducing magnification, increasing the field of view (alternatively FOCUS ▲: Increasing the working distance)

**4** ZOOM ▲: Increasing magnification, reducing the field of view

**5** Button C: Function as assigned in configuration mode 1

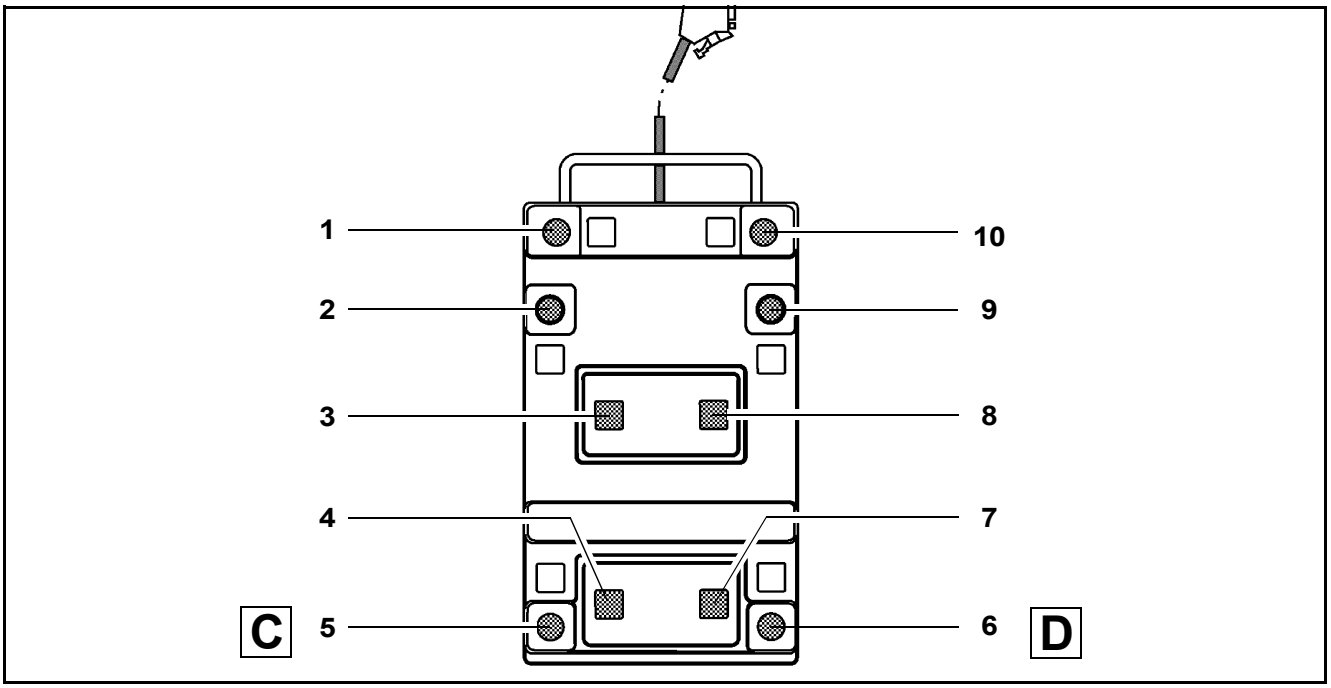
**6** Button D: Function as assigned in configuration mode 1

**7** FOCUS ▲: Increasing the working distance (alternatively ZOOM ▼: Reducing magnification, increasing the field of view)

**8** FOCUS ▼: Reducing the working distance

**9** No function

**10** Increasing the lamp brightness



# Preparations

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# Attaching the equipment

## Mounting the surgical microscope

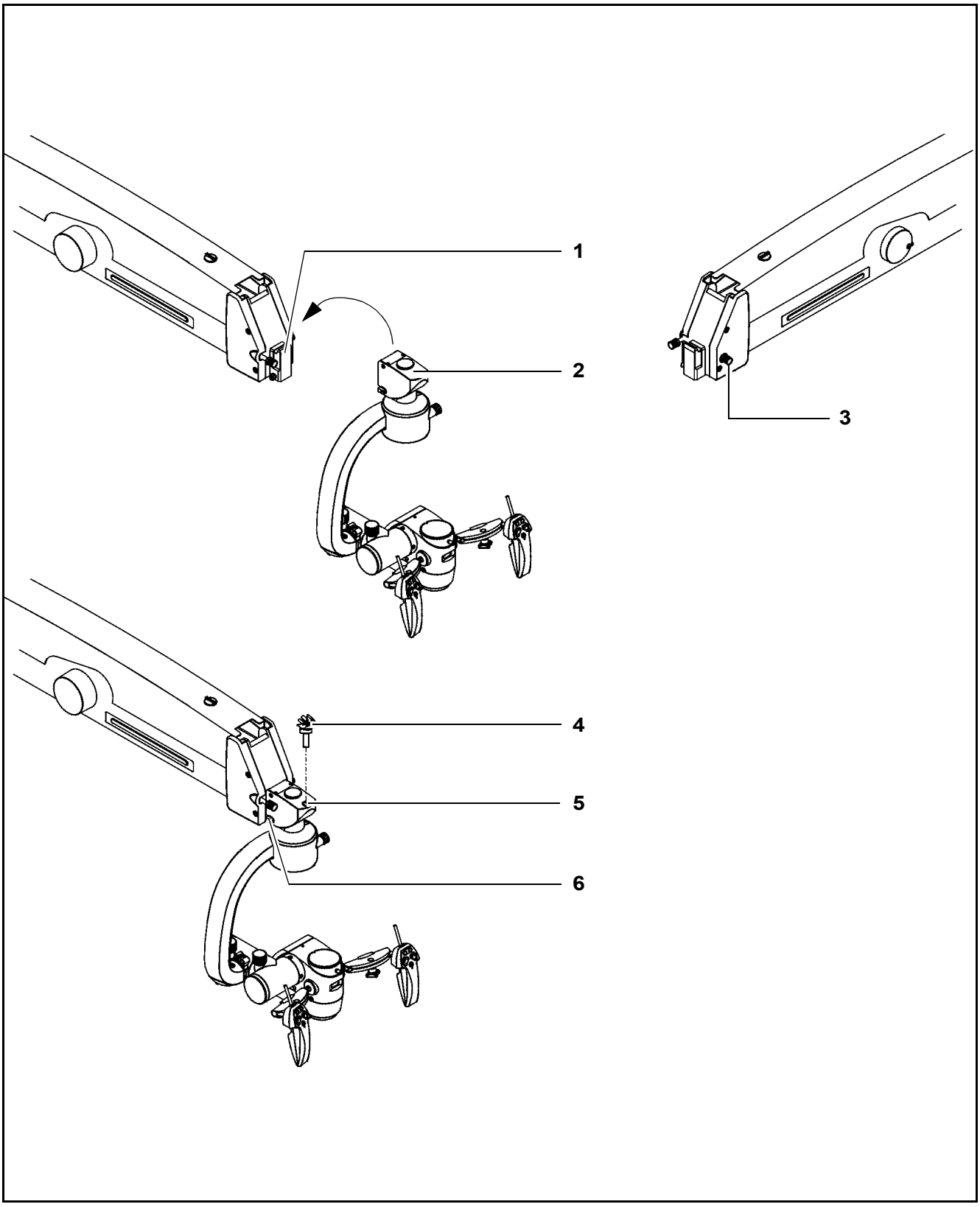
**Warning!**

The maximum weight of the microscope including accessories must not exceed 20 kg!

- Bring the suspension arm into its horizontal position, pull out locking knob (3) and turn it clockwise or counterclockwise through 180°. At the same time, slightly move the suspension arm up and down until the lock snaps in. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached.
- Turn off the system at the power switch.
- Hook coupling (2) with the attached surgical microscope at a slight angle from above into receptacle (1) on the suspension arm, and tilt the coupling downward into its vertical position.
- Tighten securing screw (6) firmly using a hex key.
- Insert cable clip (4) into opening (5) of the coupling.
- Perform the balance setting procedure.

**Warning!**

Before every use and after re-equipping the system, make sure that securing screw (6) has been firmly tightened!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## Attaching accessories

The comprehensive accessory program permits the OPMI Vario surgical microscope to be configured to your specific needs.

Make sure not to exceed the maximum admissible load in order to ensure optimum mobility and reliable operation of your OPMI Vario. The weight of the complete accessory configuration must not be higher than 9.0 kg. For example, the combined accessory modules of configuration (1) without the video objective lens and video camera have a weight of 3.9 kg.

**Caution:**

- Select your configurations so that the weight distribution is as symmetrical as possible.
- Please observe the maximum permissible load on the suspension system.
- The extensive removal of accessory modules may lead to unintended tilting of the microscope body. Rebalance the surgical microscope in this case.
- For mounting the accessory modules, proceed as described in the following section "Mounting the tube and eyepieces" () for the binocular tube.
- Attach the accessory modules to the microscope and firmly tighten the respective securing screw.

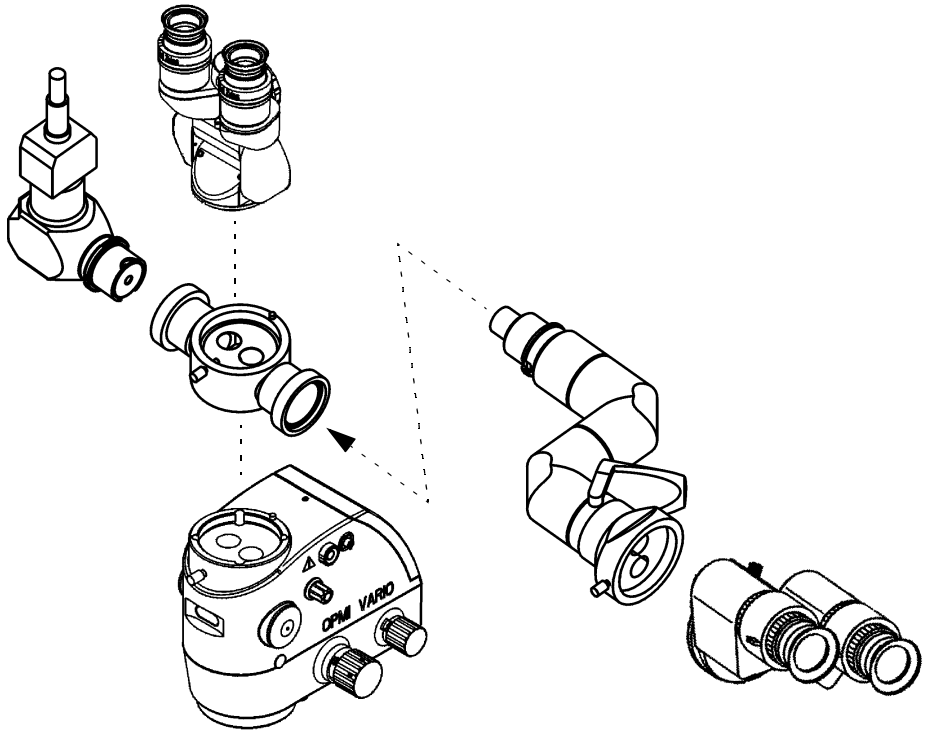
**Warning!**

- Before every use and after re-equipping the instrument, make sure that the modules are securely locked in position.
- Make sure that all securing screws are firmly tightened!
- **Accurately re-balance the surgical microscope after every reconfiguration of the system.**

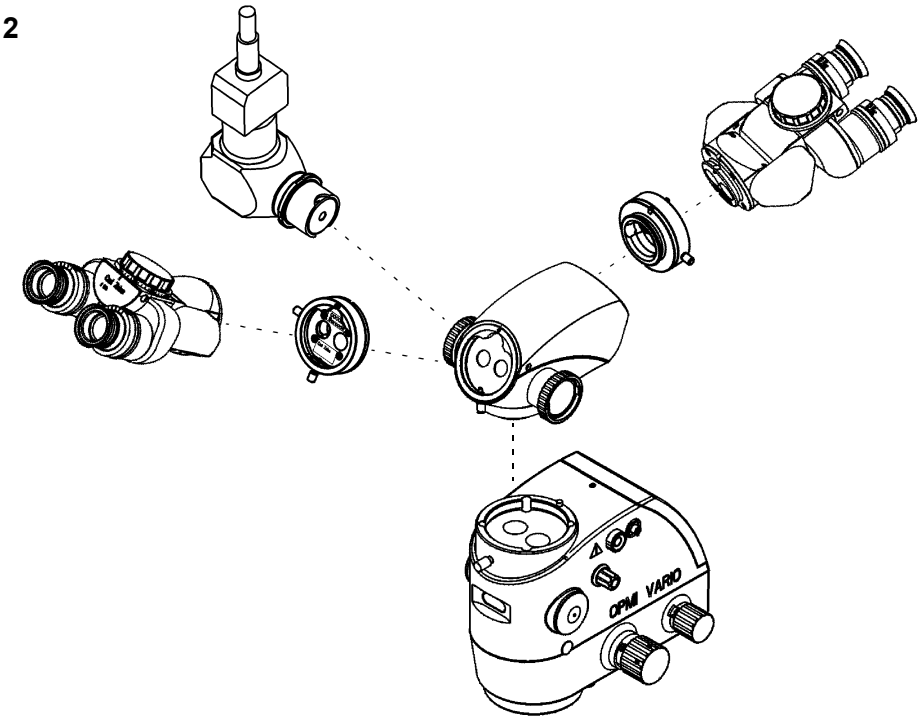
**1** Recommended configuration for lateral coobservation, left or right
Accessory modules: beam splitter, 180° tiltable tube, stereo coobservation tube with straight tube, video objective lens with video camera.

**2** Recommended configuration for face-to-face coobservation
Accessory modules: stereobridge, 2 x rotary adapter and 180° tiltable tube, video objective lens with video camera.

**1**




**2**

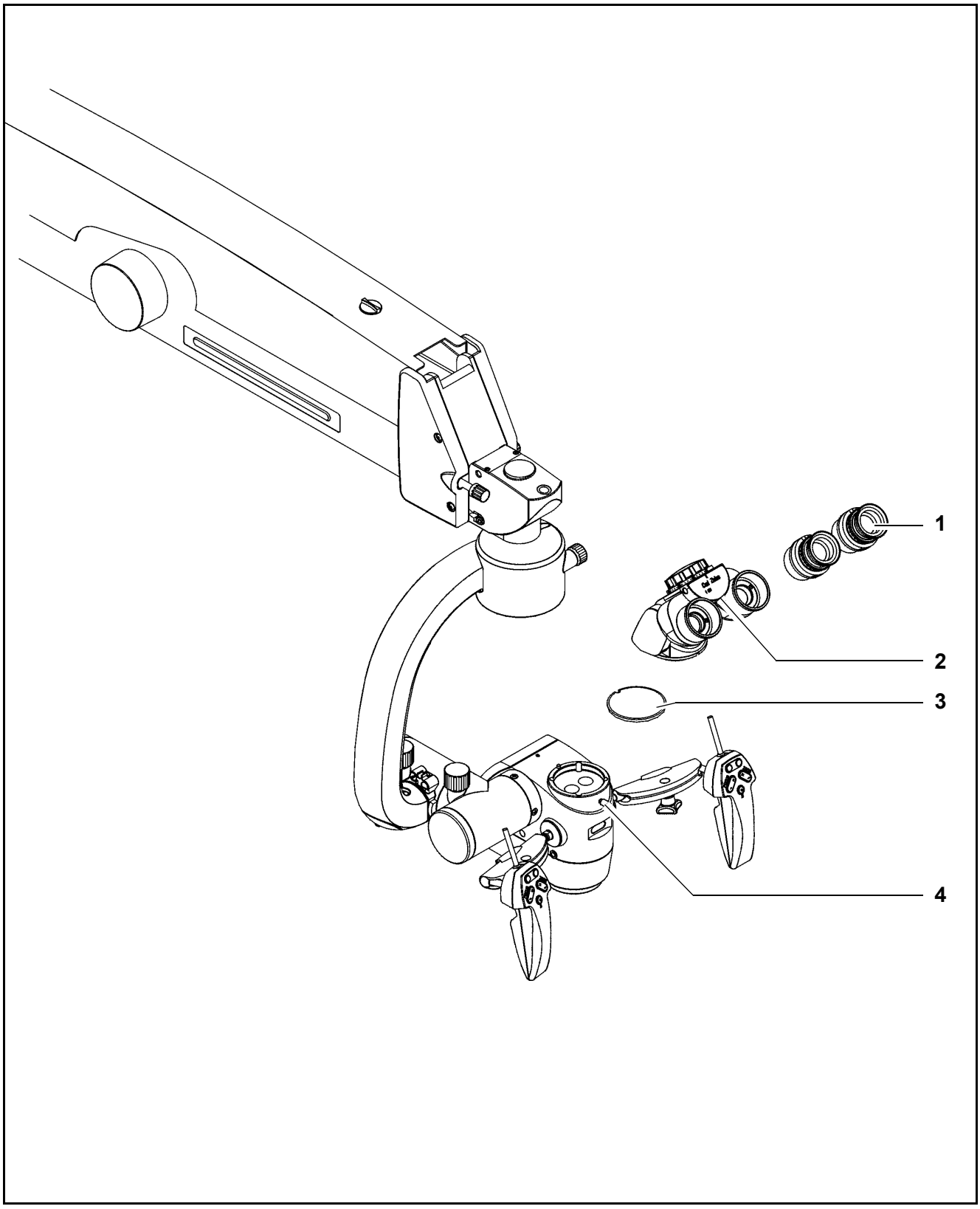


## Mounting the tube and eyepieces

- Loosen securing screw (4) by a few turns.
- Remove cover (3) and store it in a safe place.
- Place binocular tube (2) on the surgical microscope and tighten securing screw (4) firmly .
- You can install accessory equipment between the binocular tube and the microscope body. Lock these units in position in the same way using securing screw (4).
- Insert widefield eyepieces (1) into the appropriate mounts as far as they will go. The magnetic coupling reliably secures them in position.

Note:
If a documentation device is used, one of the eyepieces can be delivered with a reticle to aid focusing. Retrofitting the reticle is only possible at the factory or by our service representative. Always use the eyepiece with the reticle on the same side of the binocular tube as the documentation device is installed.

**Warning!**
Before using and after re-equipping the unit, make sure that binocular tube (2) is securely locked in position. Make sure that securing screw (4) is firmly tightened!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# Mounting the Retrolux illumination module

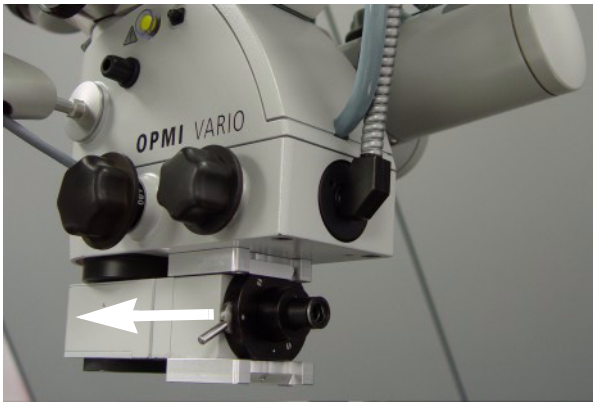
### Mounting the illumination module

**Caution:**
Limited field of view and image quality caused by incorrect attachment of the Retrolux illumination module!

Attach the Retrolux illumination module to the dovetail (1) on the underside of the OPMI Vario.

- Loosen the knurled screw (2) of the dovetail far enough to allow the Retrolux illumination module to be pushed easily into the guideway of the dovetail mount. The knurled screw (2) must not project into the guideway.
- Push the Retrolux illumination module into the dovetail mount in the direction of the arrow as far as it will go.

1
2


OPMI VARIO

### Locking the illumination module into position and connecting the light guide

**Caution:**
Risk of damage to the thread of the knurled screw!
Do not overtighten knurled screw (2).

- Tighten the knurled screw (2) by hand in a clockwise direction.

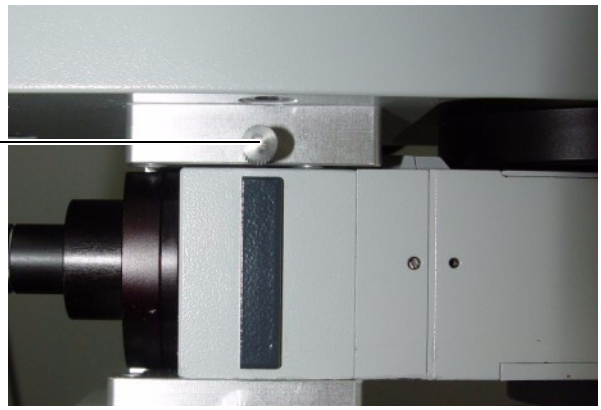
**Warning!**
Danger of dazzle at the light guide!

- Switch off the OPMI Vario at the power switch before changing the light guide.
- Remove the light guide (4) from the OPMI Vario.
- Insert the light guide (4) in the light guide connector of the Retrolux illumination module (3).

### Removing the illumination module

**Warning!**
Danger of dazzle at the light guide!

- Switch off the OPMI Vario at the power switch before changing the light guide.
- Remove the light guide from the Retrolux illumination module.
- Insert the light guide in the light guide connector (5) on the OPMI Vario.
- Loosen the knurled screw by turning it counterclockwise.
- Pull the Retrolux illumination module out of the dovetail mount in the direction of the arrow.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OPMI VARIO
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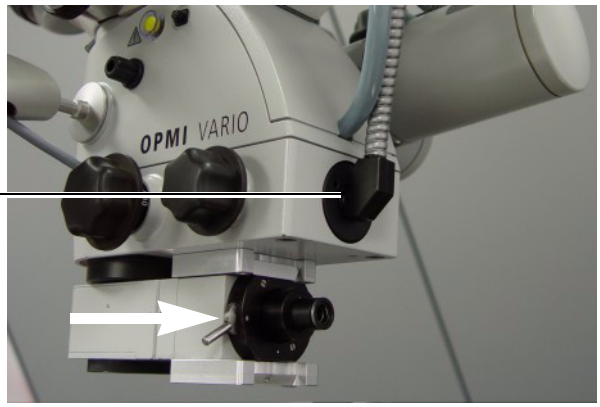

OPMI VARIO
5

# Bringing the Retrolux illumination module into its standby position

If you do not need the Retrolux illumination module, you can bring it into its standby position on a dovetail mount  The dovetail mount and the appropriate suspension cover must be mounted on the suspension. Proceed as follows:

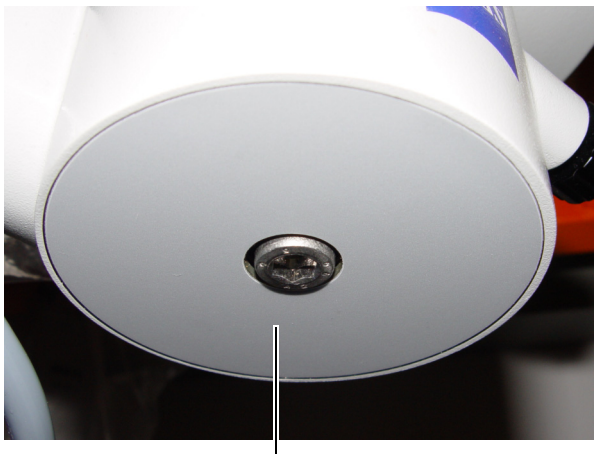
### Mounting the illumination module on the dovetail mount

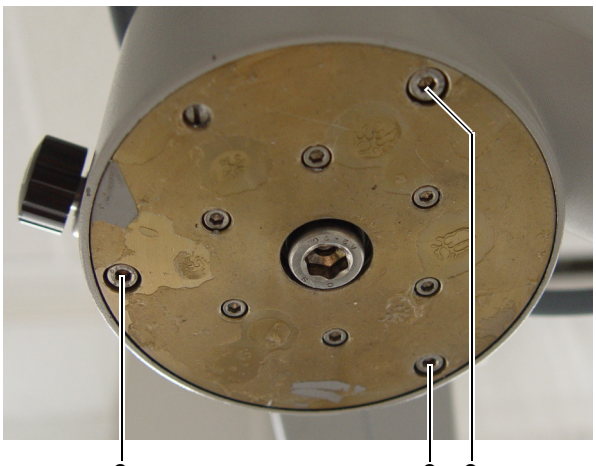
**Caution:**
If not properly locked in position, the system may be damaged.

- Lock the system in position by switching it off at the power switch. When the system is separated from line power, the magnetic brakes lock the axes and the system remains in position.
- Remove protective foil (1) on the underside of the suspension.
- Remove screws (2) on the underside of the suspension by turning them counterclockwise.
- Attach suspension cover (3) to the suspension and firmly tighten screws (2) in a clockwise direction.
- Attach dovetail mount (4) by placing the groove on projection (5).
- Screw down dovetail mount (4) on projection (5). Use the accompanying hex screw for this purpose.
- Push illumination module (6) into dovetail mount (7) in the direction of the arrow.
- Tighten the knurled screw on the illumination module.
- Turn on the system at its power switch.

### Removing the illumination module from the standby position

- Loosen the knurled screw of the illumination module.
- Push illumination module (6) out of dovetail mount (7) in the direction of the arrow.


1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ZEISS
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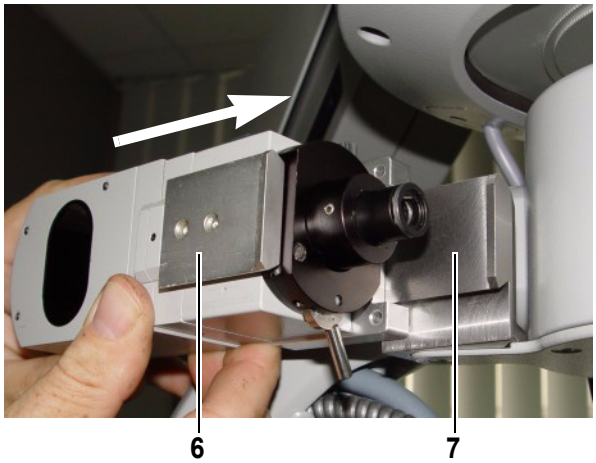
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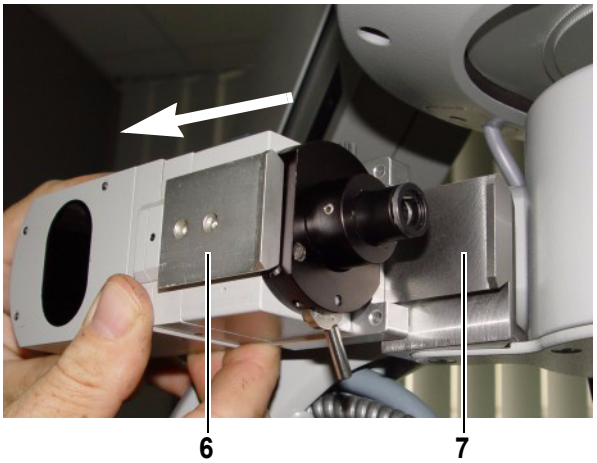
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## Attaching the fundus imaging system to the illumination module

**Warning!**
Injury to the patient's eye and impaired image quality caused by incorrect operation of the fundus imaging system.

- Read the user manual for the fundus imaging system carefully.
- Always perform all the described steps before surgery without the patient.

The fundus imaging system (3) (e.g. BIOM 3) is attached to the dovetail mount (1) on the underside of the illumination module.

- Loosen knurled screw (2) of dovetail mount (1) far enough to allow the fundus imaging system to be pushed easily into the guideway of the dovetail mount.

**Caution:**
Limited field of view and poor image quality caused by incorrect attachment of the fundus imaging system!

- Push the fundus imaging system into the dovetail mount in the direction of the arrow as far as it will go.

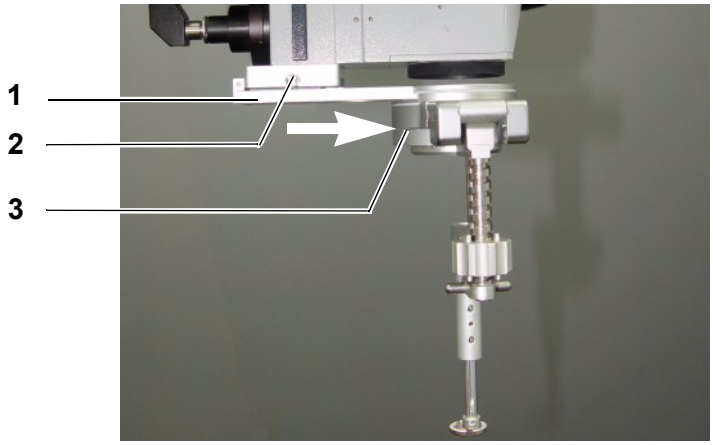
### Locking the fundus imaging system into position

**Caution:**
Damage to the thread of the knurled screw and the fundus imaging system! Do not overtighten knurled screw (2).

- Tighten knurled screw (2) by hand in a clockwise direction.

### Removing the fundus imaging system

- Loosen the knurled screw by turning it counterclockwise.
- Push the fundus imaging system out of the dovetail mount in the direction of the arrow.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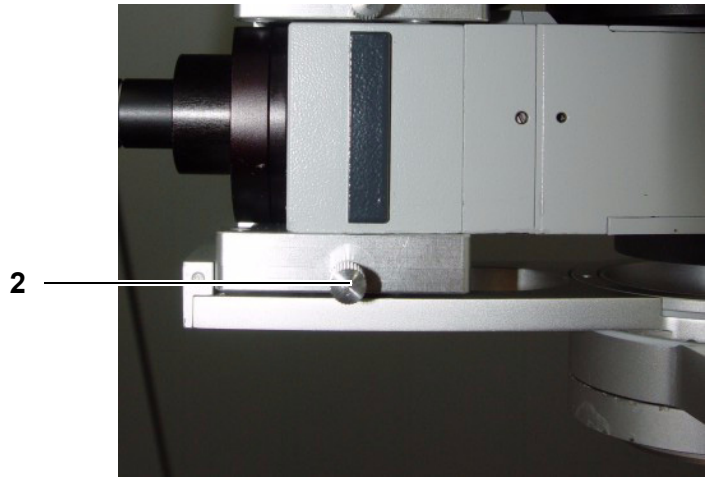
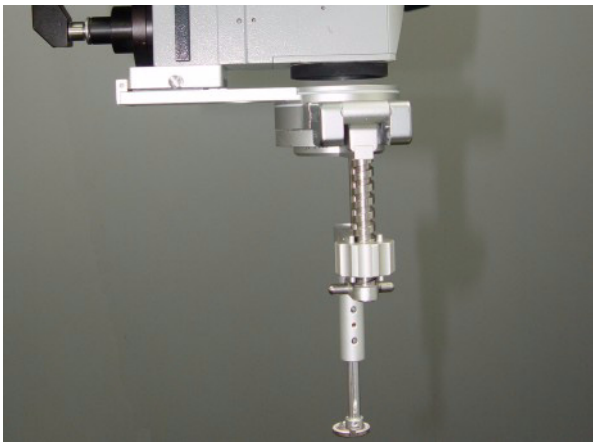
3


2



# Connections

## Connecting the surgical microscope

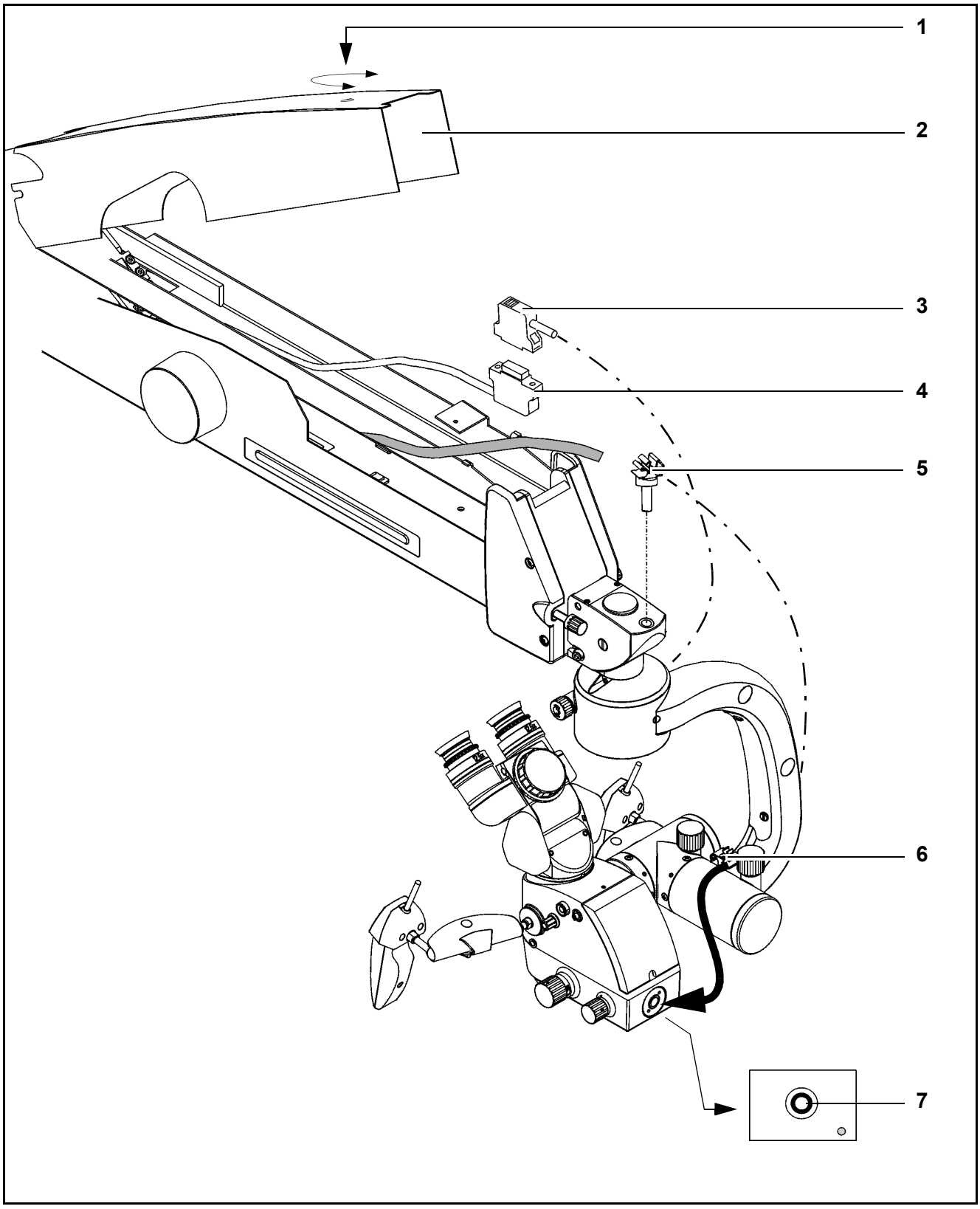
- Turn locking cap (1) by a quarter turn to the right or left and pull up cover (2).
- Plug microscope connector (3) into connector (4) and tighten the securing screws on the microscope connector.
- Press the microscope cable into cable clip (5). Install the cable in such a way that it is neither stretched nor kinked when the microscope is turned or tilted.
- Press down cover (2) as far as it will go and lock it with cap (1).

Note:
The illustration on the right shows the surgical microscope in a rotated position.

## Mounting the light guide

- Switch off the illumination system.
- Insert the end of the light guide into light guide socket (7) of the microscope as far as it will go, and press the light guide into cable clip (6).
- Make sure that the light guide has been routed with sufficient slack so that the movement of the carrier system and surgical microscope is not restricted and that they can be moved in all directions without stretching, extreme kinking or twisting of the light guide.

Note:
Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.


1
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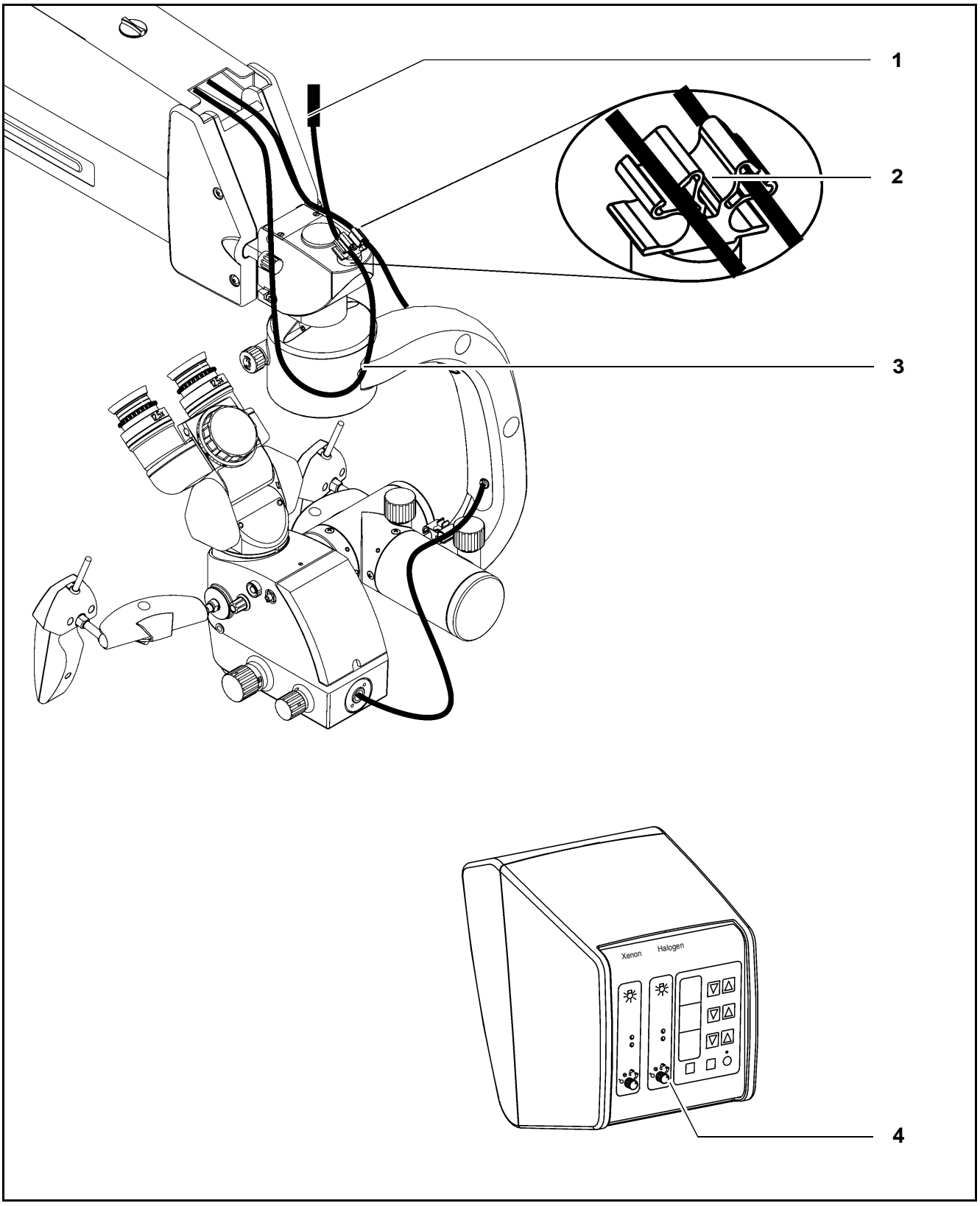
7

**Warning!**
It may happen that no second lamp module such as the VISULUX™ fiber slit lamp is used on the microscope.

To prevent light guide (3) provided for this purpose from injuring the patient, you must attach it to the cable holder of the suspension system.

- Switch off the illumination system for the unneeded light guide by setting the illumination selector switch (4) to the left.
- Press the light guide into an empty position of cable holder (2).
- Remove cap (1) from the light guide. This prevents melting of the cap in case the second illuminator is switched on by mistake.


1
2
3
Xenon
Halogen
4

## Aligning the X-Y coupling

Note:

- The OPMI® VARIO can be equipped (and also retrofitted) with an X-Y coupling. Our service team or an authorized person will install the X-Y coupling for you.

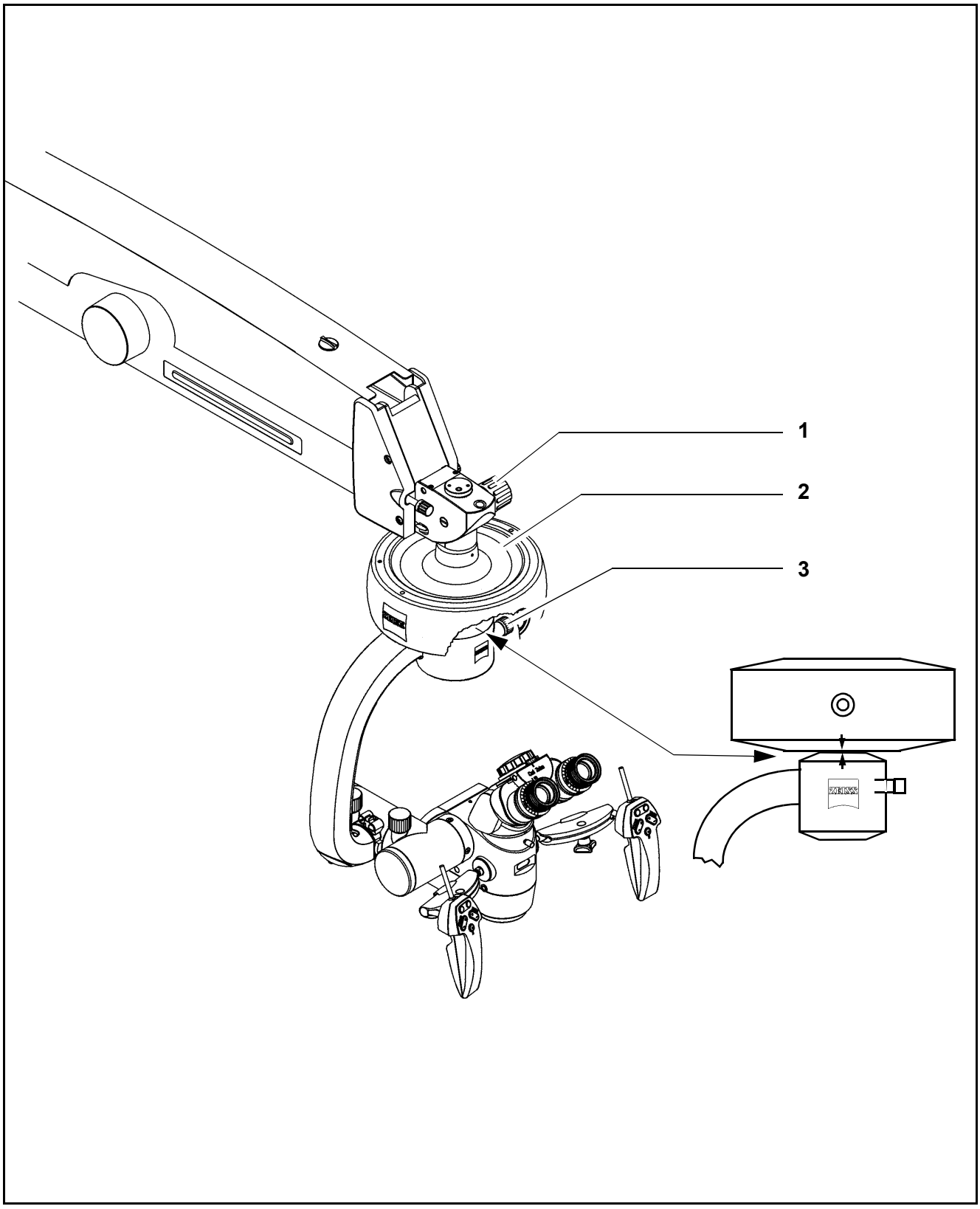
The X-Y coupling allows motorized fine positioning of the surgical microscope in a horizontal plane. The range of travel is 40 mm x 40 mm. The speed of travel can be set on the display field of the suspension system.

To ensure that the X-Y coupling of the surgical microscope is accurately positioned in the X and Y directions, proceed as follows:

- Tighten friction adjustment knob (1) and open knob (3) by a few turns.
- Arrows are provided at the bottom of X-Y coupling (2) and at the top of the magnetic brake. Turn the surgical microscope until the arrows point towards each other.
- Firmly tighten knob (3).

Note:
The surgical microscope and X-Y coupling are now permanently connected.

- Adjust the friction of the OPMI® rotary axis using knob (1).


1
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3

## Strain relief device on S88 floor stand

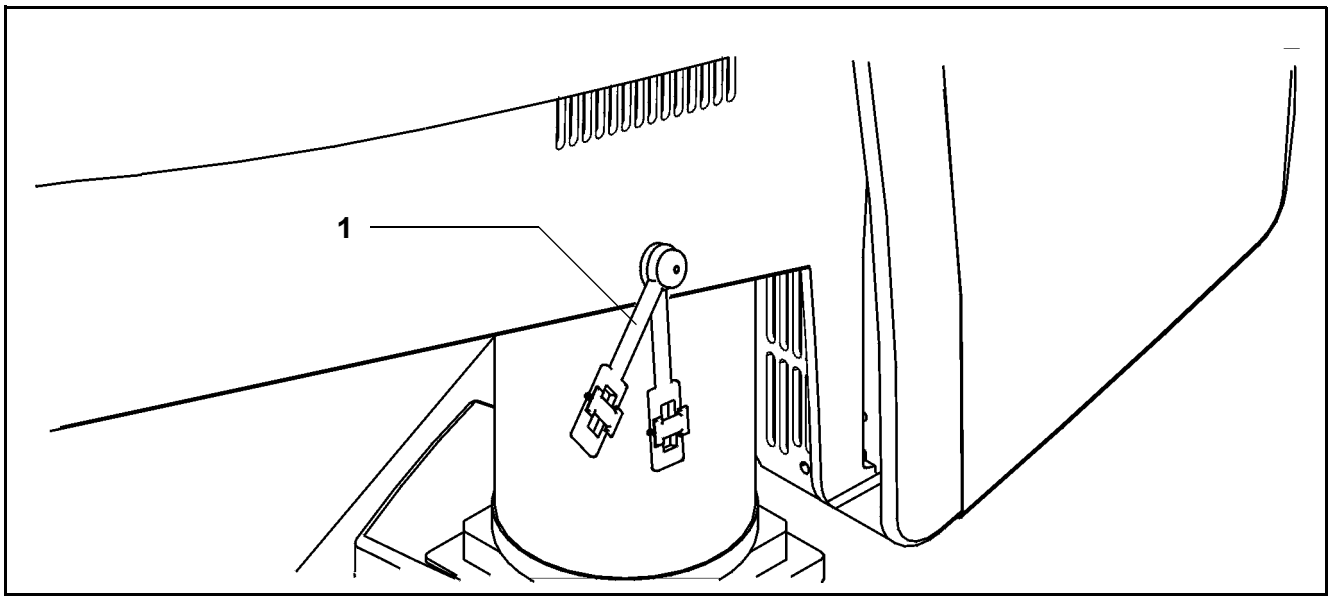
Note:
You can secure the power plug and the multipoint connector of the switching component against inadvertent loosening by installing the two cables in strain relief device (1).

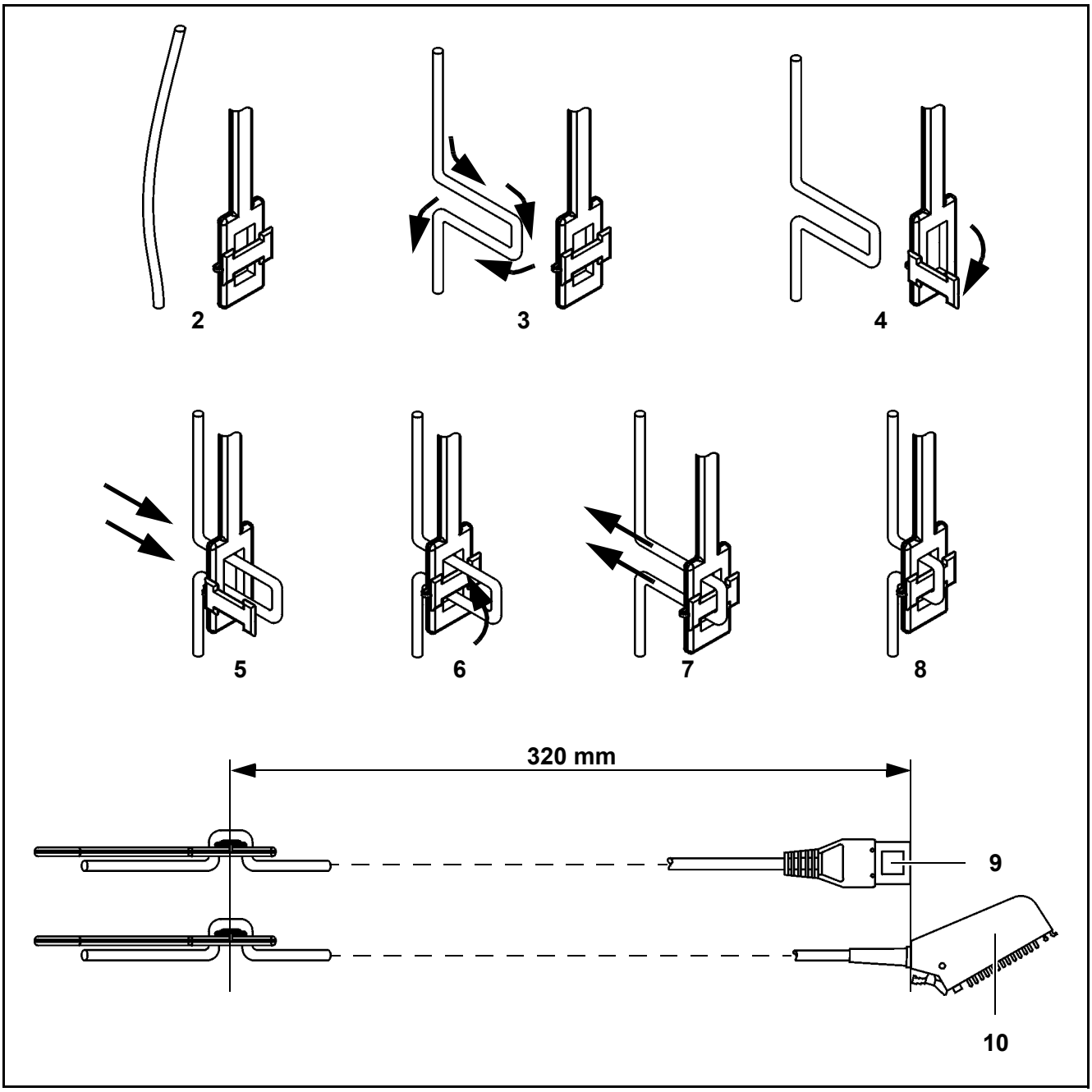
After you have mounted strain relief device (1), the cable must have the following length:

– 320 mm from the strain relief device up to and including power connector (9).

– 320 mm from the strain relief device up to connector (10) of the foot control panel or of an operating chair with appropriate footswitch.

- Form a loop with the cable as shown in (3).
- Open flap (4).
- Feed the cable through opening (5).
- Close flap (6).
- Tighten the cable until it encloses flap (7).
- Check the length of the cable.




2
3
4
5
6
7
8
320 mm
9
10

## Connecting the S88 floor stand

- Check the voltage indicated at (3).

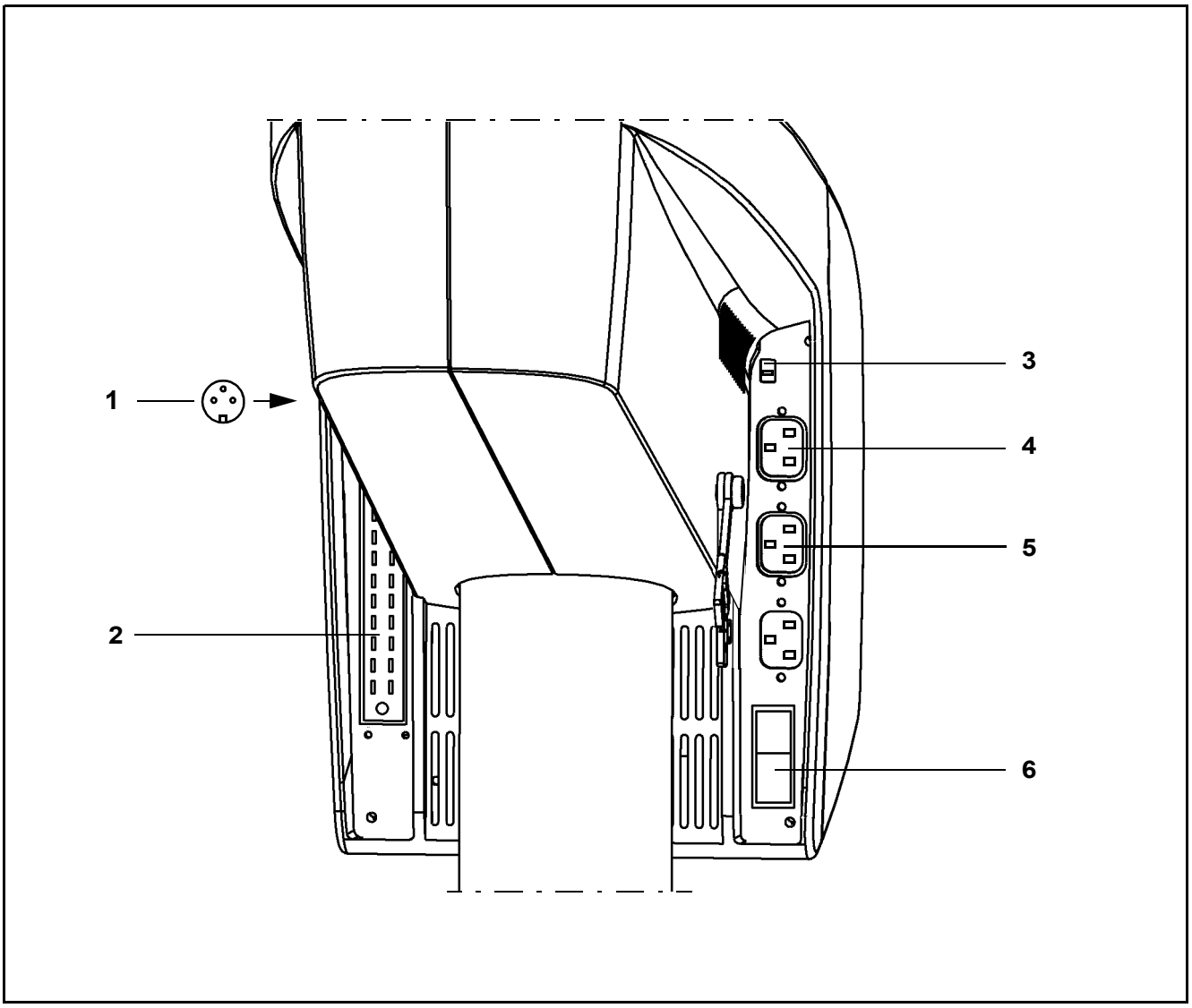
**Caution:**
The suspension system is set at the factory to the rated voltage used in the country of destination. The rated voltage indicated at window (3) must correspond to the rated voltage available on the site of installation. If this is not the case, you must re-adjust the sliding switch using a suitable tool.

Note:
Insert or remove connectors at (2), (4) and (5) only if power switch (6) is off.

- Plug the connector of the foot control panel or operating chair into connector (2) of the suspension system.
- Secure the microscope cable in the cable clip in such a way that it is not stretched or bent when the microscope is turned or tilted.
- Secure the light guide in the cable clip and insert the light guide into the light guide socket on the microscope as far as it will go. Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.

Use remote control socket (1) to connect external devices with max. 24 V / 0.5 A which can be switched on / off via an AUX signal using the freely programmable buttons on the foot control panel.

Connect the suspension system to line power using the power cord intended for it. Only use a power outlet which is provided with a properly connected protective earth conductor.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6

# Adjusting the supension system

## Adjusting the balance setting of the suspension arm

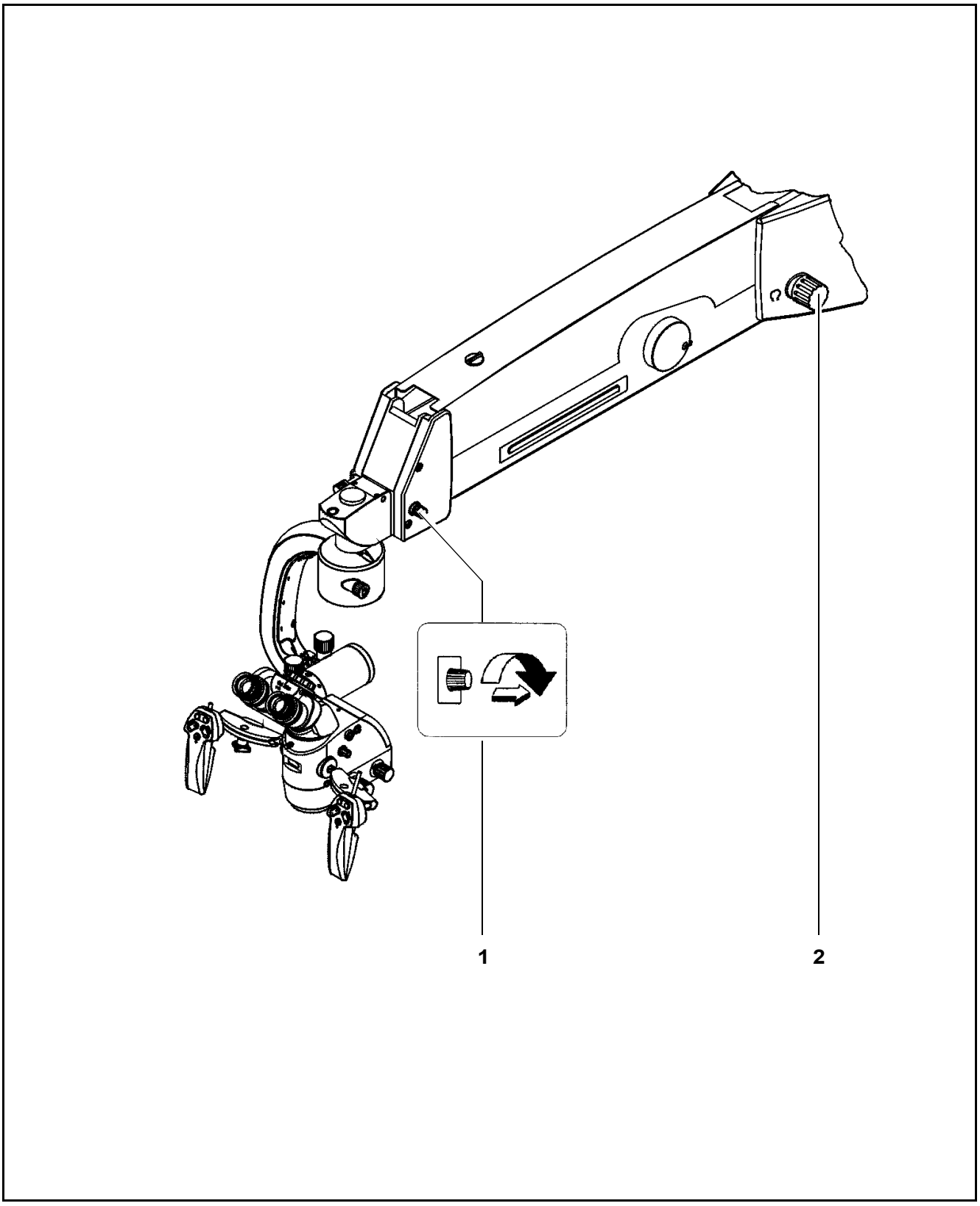
- Now perform the balance setting procedure with the complete microscope equipment attached!

Note:
Before you precisely adjust the balance setting of the suspension arm, we recommend performing a coarse balance setting of the arm. For this, the suspension arm must be locked in its horizontal position.

- To perform the coarse balance setting, move the suspension arm slightly up and down. At the same time, turn the adjustment screw (2) until you think that the spring force is sufficient to compensate for the weight of the surgical microscope and accessories.

Note:
Clockwise turning increases the spring force, counterclockwise turning reduces the spring force.

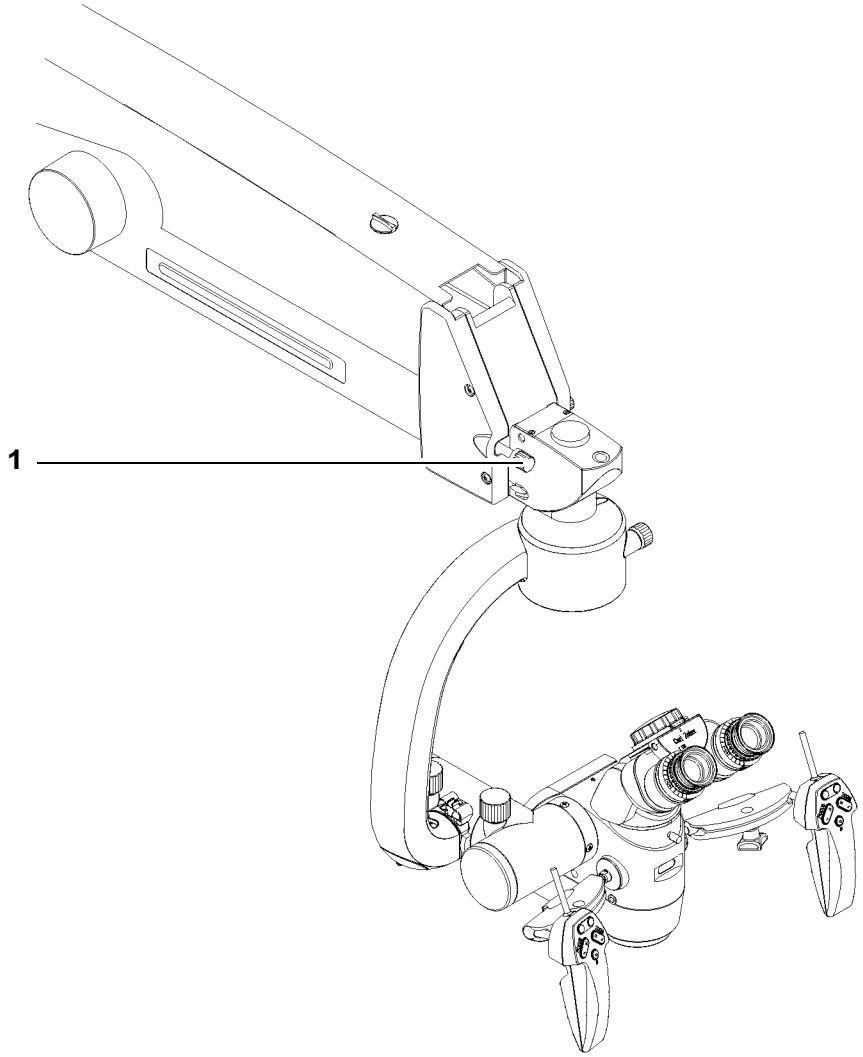
- Hold the suspension arm and pull out the locking knob (1). This must be possible without requiring a special effort. Otherwise, re-adjust the spring force using the adjustment screw (2).
- Press one of the release keys for the magnetic brakes on the microscope during the balance setting procedure. Move the suspension arm alternately up and down by approx. 20 cm. Using adjustment screw (2), adjust the spring force in such a way that the effort required to move the arm up or down is the same in both directions.


1
2

## Adjusting the limit of downward movement

The vertical lift of the suspension arm must be limited in such a way that the patient's safety is also ensured when the microscope is inadvertently lowered.

- Loosen the adjustment screw (1) by a few turns.
- Press one of the release keys for the magnetic brakes on the surgical microscope and lower the microscope to a position where it can be focused on the surgical field (depending on the focal length of the objective lens) and where the safety distance to the surgical field is still sufficient.
- Turn the adjustment screw (1) clockwise as far as it will go.
- Move the surgical microscope again to the lower limit and check the safety distance.


1

# Balancing the surgical microscope

**Warning!**
Balance the completely equipped surgical microscope before surgery without the patient.

To permit almost effortless guidance of the surgical microscope, the surgical microscope and the suspension system used must be correctly balanced. If the system is in an extremely unbalanced state, the unit can move uncontrollably out of position. For this reason, hold the surgical microscope tightly at its handgrips before releasing the magnetic brakes.

Note:
To set the balance of the microscope's axis of rotation, the lateral and front-to-back tilt axes and to adjust the friction of the axis of rotation, press the magnetic brake release button on one of the handgrips.

When adjusting balancing knobs (2 and 3), carefully turn them in either direction shown on the labels. To avoid damaging the balancing system, do not use force by turning the knobs too far.

- Turn on the instrument at the power switch of the suspension system.

### Adjusting the friction of the axis of rotation

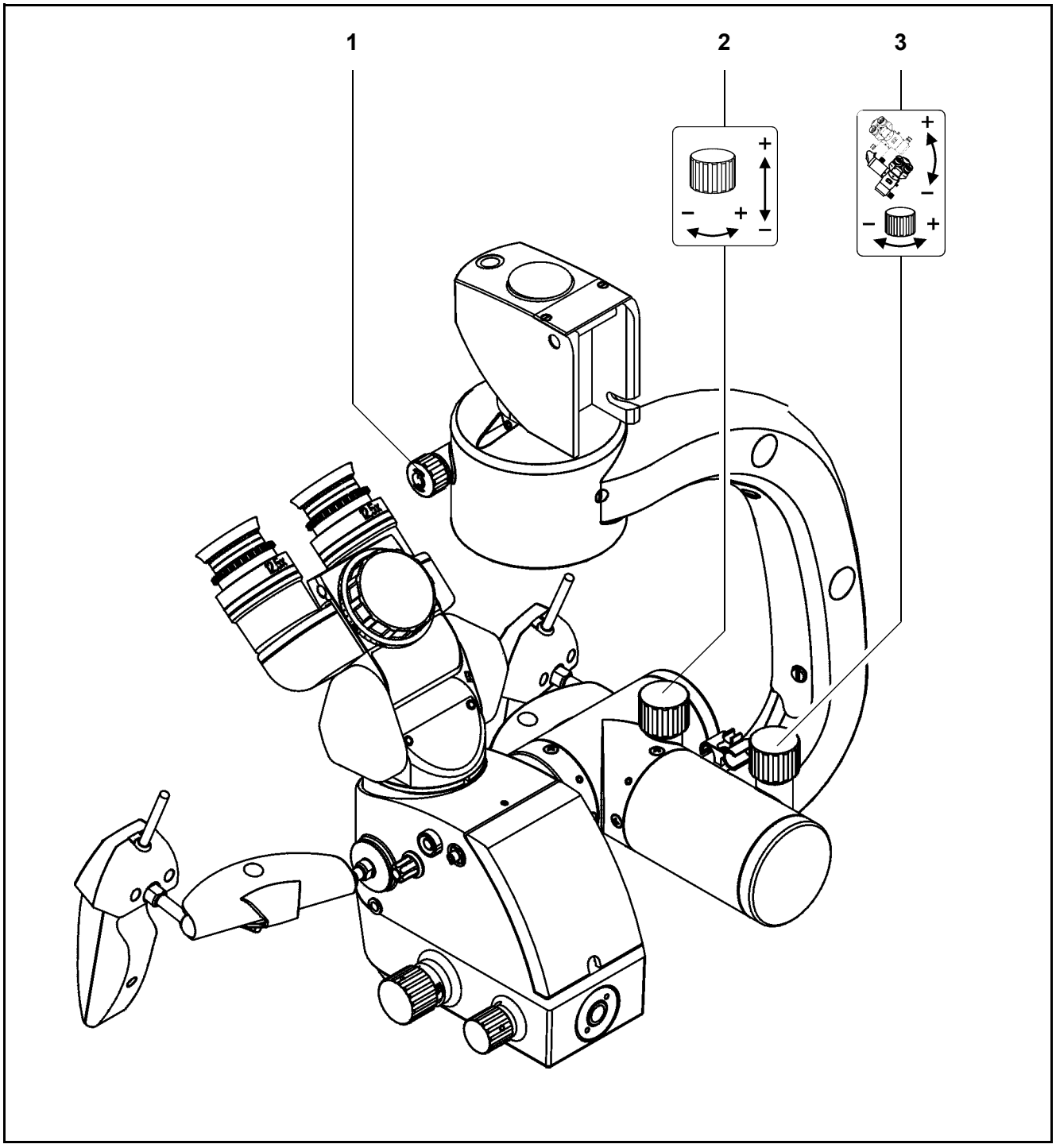
- Use knob (1) to adjust the friction of the microscope's axis of rotation as required.

### Balancing the front-to-back tilt motion

- Use knob (2) to adjust the spring force in such a way that the surgical microscope is balanced about its front-to-back tilt axis and remains stationary in the viewing direction required.

### Balancing the lateral tilt motion

- Use knob (3) to adjust the spring force in such a way that the surgical microscope is balanced about its lateral tilt axis and remains stationary in the viewing direction required.


1
2
3

# Settings on the control and display panel

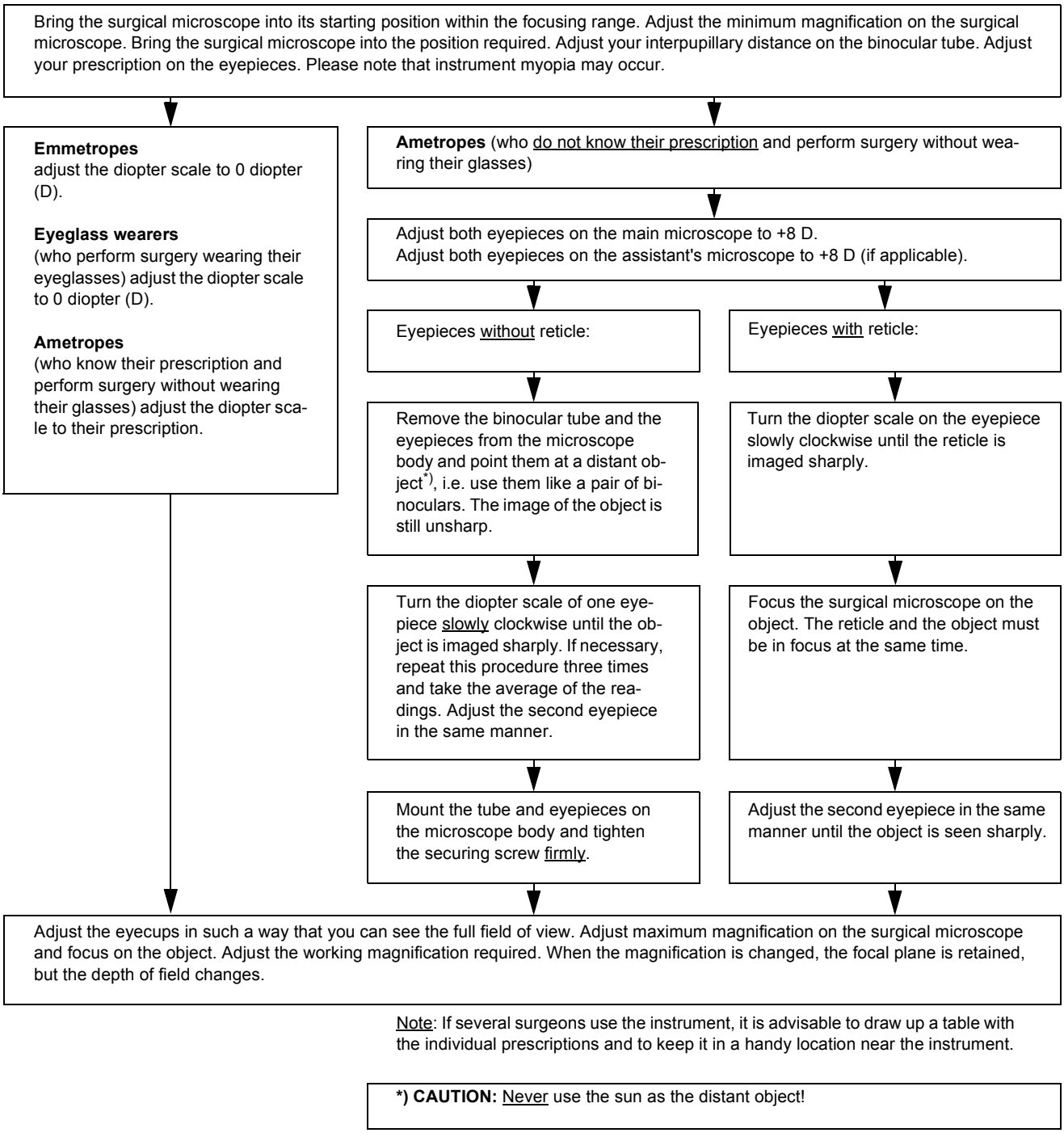
## Adjusting the suspension system

- Turn on the suspension system at its power switch.
- Successively select the following functions on the suspension system:
  - lamp brightness,
  - motor speeds for zoom,
  - focus and
  - X-Y coupling.
- Set the lamp brightness as follows:

  Start with the minimum brightness setting, and gradually increase the brightness until the necessary and still admissible level has been reached.
  - Xenon: adjustment range: 1 ... 10
- Set the values required for
  - motor speeds of the functions zoom,
  - focus and
  - X-Y coupling.

  Motor speed
  Adjustment range: 1...10
  Level 1 corresponds to the lowest, level 10 to the highest motor speed.

# Adjusting the surgical microscope


Bring the surgical microscope into its starting position within the focusing range. Adjust the minimum magnification on the surgical microscope. Bring the surgical microscope into the position required. Adjust your interpupillary distance on the binocular tube. Adjust your prescription on the eyepieces. Please note that instrument myopia may occur.
Emmetropes
adjust the diopter scale to 0 diopter (D).
Eyeglass wearers
(who perform surgery wearing their eyeglasses) adjust the diopter scale to 0 diopter (D).
Ametropes
(who know their prescription and perform surgery without wearing their glasses) adjust the diopter scale to their prescription.
Ametropes (who do not know their prescription and perform surgery without wearing their glasses)
Adjust both eyepieces on the main microscope to +8 D.
Adjust both eyepieces on the assistant's microscope to +8 D (if applicable).
Eyepieces without reticle:
Remove the binocular tube and the eyepieces from the microscope body and point them at a distant object*), i.e. use them like a pair of binoculars. The image of the object is still unsharp.
Turn the diopter scale of one eyepiece slowly clockwise until the object is imaged sharply. If necessary, repeat this procedure three times and take the average of the readings. Adjust the second eyepiece in the same manner.
Mount the tube and eyepieces on the microscope body and tighten the securing screw firmly.
Eyepieces with reticle:
Turn the diopter scale on the eyepiece slowly clockwise until the reticle is imaged sharply.
Focus the surgical microscope on the object. The reticle and the object must be in focus at the same time.
Adjust the second eyepiece in the same manner until the object is seen sharply.
Adjust the eyecups in such a way that you can see the full field of view. Adjust maximum magnification on the surgical microscope and focus on the object. Adjust the working magnification required. When the magnification is changed, the focal plane is retained, but the depth of field changes.

Note: If several surgeons use the instrument, it is advisable to draw up a table with the individual prescriptions and to keep it in a handy location near the instrument.

***) CAUTION:** Never use the sun as the distant object!

# Surgical microscope with a laser micromanipulator

Please observe the separate user manual for your laser micromanipulator.

**Warning!**
It is absolutely vital that the focal planes of the surgical microscope and of the laser micromanipulator are identical.

Before every laser application of the surgical microscope using a laser micromanipulator, you must adjust the focal plane of the microscope to the focal plane of the laser micromanipulator. After correct matching of the two focal planes, the focus of the surgical microscope (Varioskop) must not be changed in order to avoid any deviations in the focal planes and, as a result, an unfocused laser beam during the laser application.
Always check the correct adjustment before surgery (without patient!) and before every laser application as follows (recommended procedure):

- Set the microscope to maximum magnification.
- Some micromanipulators offer the possibility of targeted laser beam defocusing in the focal plane. Make sure that the laser is in the position for the smallest possible laser spot for this check. Please observe the separate user manual for your laser micromanipulator.
- Hold a wooden spatula in the focal plane in such a way that you see it sharply focused.
- Trigger a few trial shots of the laser at the spatula, slightly changing the spatula position relative to the focal plane for each shot.
  The therapy beam of the laser displays its maximum effect in the focal plane of the laser micromanipulator. The wooden spatula must be sharply focused in this position. Only then will the two focal planes coincide. If this is not the case, correct the adjustment of the two focal planes.
- Repeat the test until full coincidence of the focal planes has been obtained.

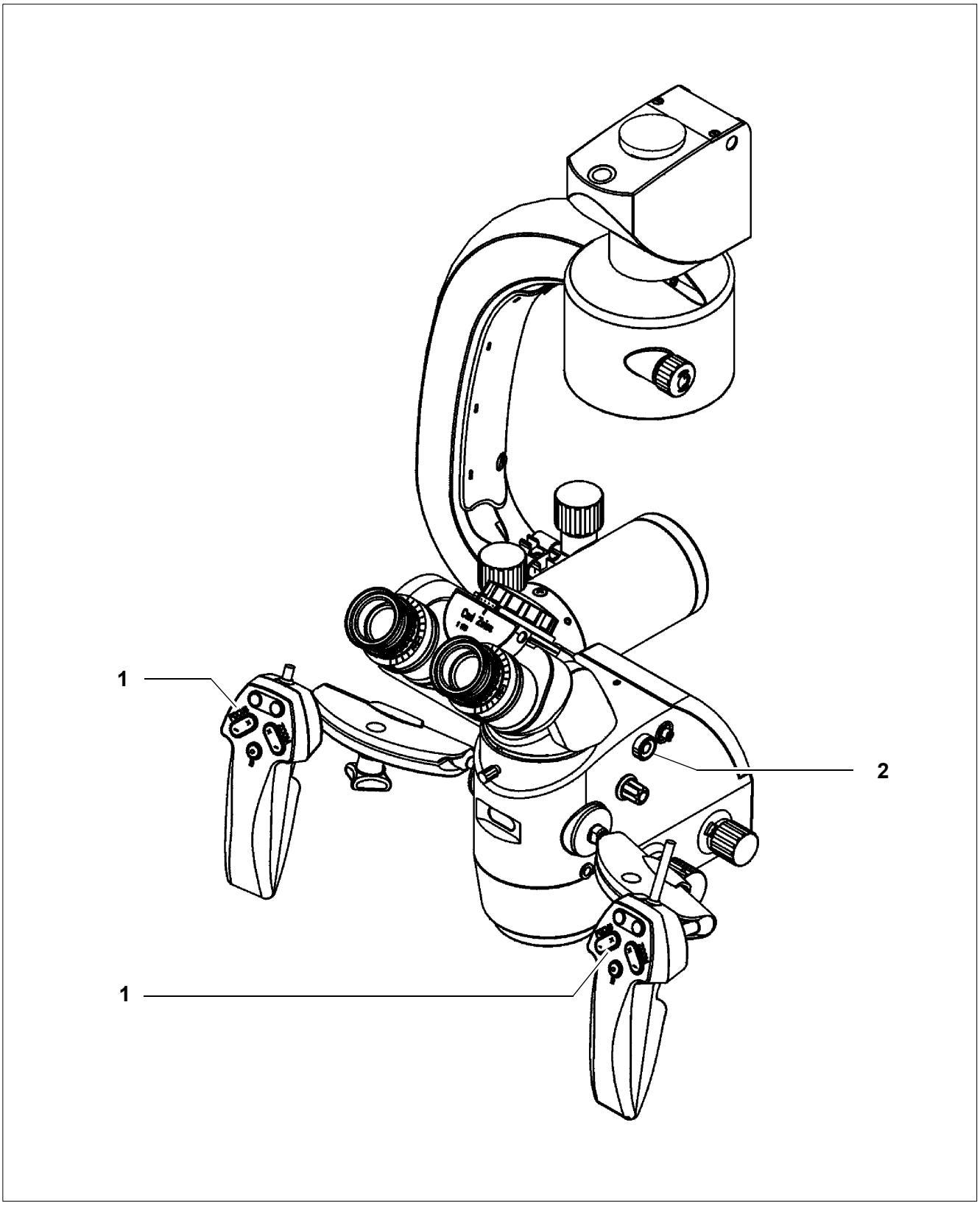
**Adjusting the surgical microscope and laser micromanipulator to the same focal plane**

The OPMI Vario is equipped with a motorized Varioskop zoom system which is operated via the focusing buttons of handgrip (1) or the foot control panel.

The Varioskop is used for the motorized setting of the working distance (coarse focus) and the motorized adjustment of image definition (fine focus). The focusing buttons allow you continuous adjustment of the working distance between 200 mm and 415 mm.

- Set the working distance (coarse focus) to the focus value of the laser micromanipulator. The display shows the focus value currently set.
- Use the previously described, recommended procedure to check that the focal planes coincide.
- If necessary, correct the focus by appropriate minor adjustment (fine focus).

Focus stop button (2) permits you to deactivate the electrical drive of the focusing system. The focus stop button is lit. This prevents the setting from being inadvertently changed by the motorized function.


1
2
1

# Relocating the system

Note:
As the stand is very easy to maneuver, there is a tendency to underestimate its considerable weight. Therefore, move the stand slowly and carefully!

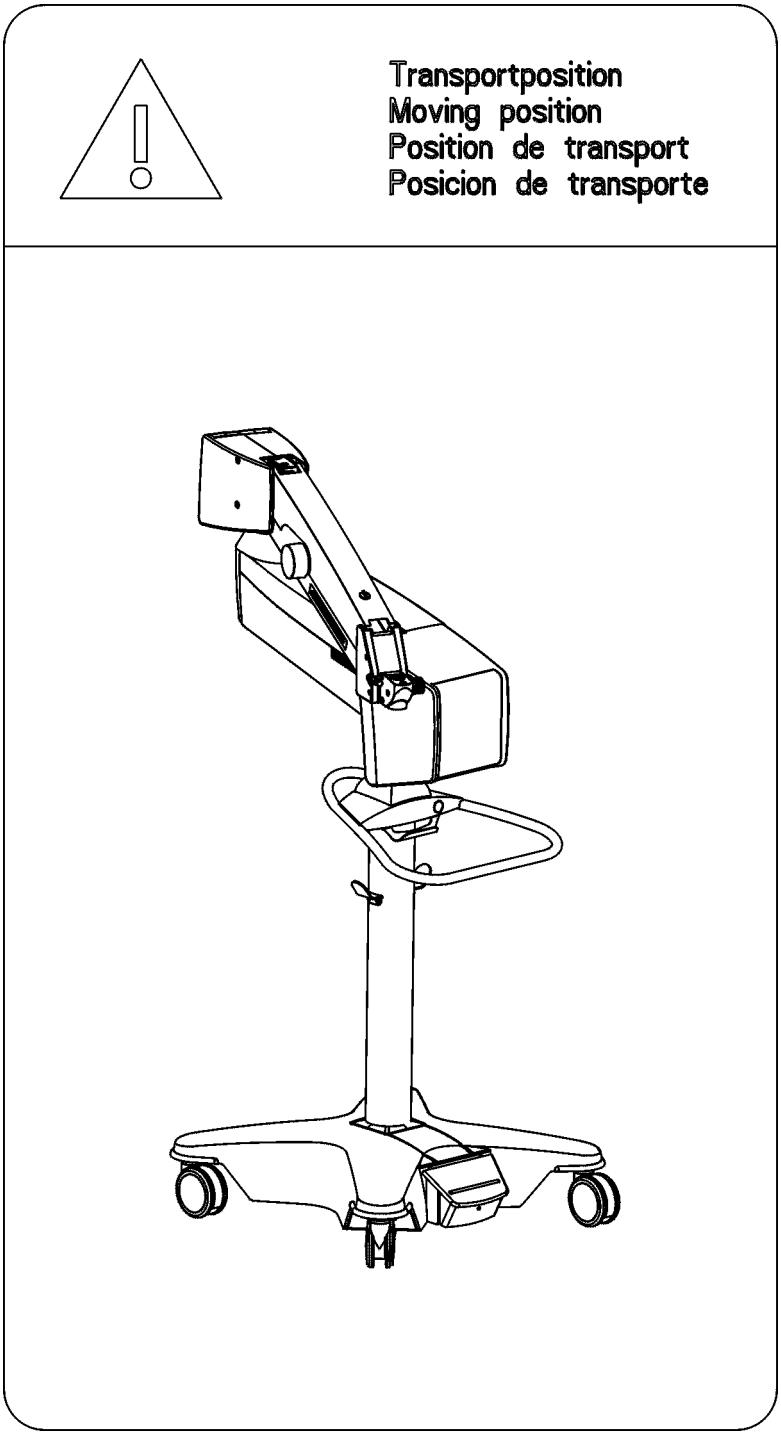
Please observe the following points when relocating the stand:

- Fold the suspension arm to its moving position (see illustration on the opposite page).
- Switch off the illumination system using the knobs, and the system at its power switch.
- Unplug the power cord from the wall outlet.
- Wind up the cable of the foot control panel on one of the cable supports, and hang the foot control panel on the handle.
- Wind up the power cord on the other cable support.
- Use the maneuvering handle for moving the stand.
- Be careful of heights when passing through doorways.
- Avoid collisions of any kind.

- Do not go over steps and edges: the stand might topple!
- Be extremely careful when moving over slopes.
- Do not park the stand on slopes.

Press the brake tab to lock the stand in position. Make sure that the stand is no longer able to roll away by itself.

**Caution:**
Over longer distances (e.g. removal, return for repair, etc), the instrument must always be transported in the original packaging or in special return packaging. For details, please contact your dealer or the Carl Zeiss service team.


Transportposition
Moving position
Position de transport
Posicion de transporte

# Operation

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**Positioning the S88 floor stand** **134**

**Using the display and key field** **136**

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OPMI Vario on the suspension system, user interface with SpeedFokus option 140

**Procedure** **160**

**What to do in an emergency** **162**

Failure of a xenon lamp 162

Failure of lamp control 164

Failure of the zoom function 165

Failure of the focusing function 166

Failure of magnetic brakes 167

# Checklist

**Warning!**
If a function fails, you must not use this instrument for safety reasons. Correct the fault (see the "Troubleshooting table“) or contact our service dept.

Always check the following points before surgery (without patient!):

- Make sure that there is enough room between the instrument and the accessories installed and that the protective cover (2) is removed from the objective lens.
- Turn on the system at the power switch of the suspension system.

Illumination
– Check that light guide (7) has been connected.

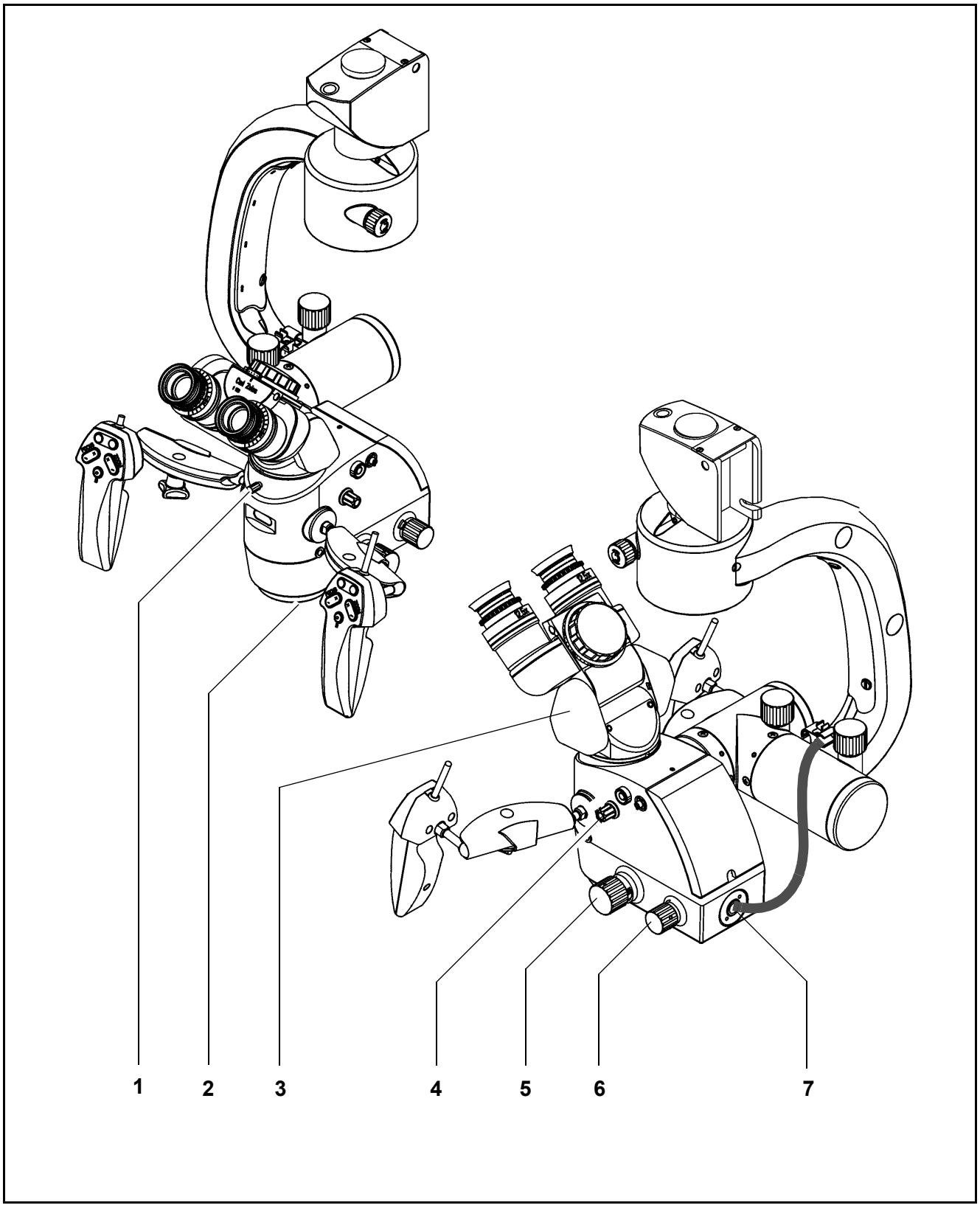
Zoom
– Check this function using the appropriate key.

Focus
– Check this function using the appropriate key.

Knobs
– Check the friction of the knobs for zoom (4), focusing (5) and illuminated-field size (6).

Eyepieces / binocular tube
– Check that binocular tube (3) has been securely mounted.
– Check that securing screw (1) has been firmly tightened.
– Check that the surgical microscope and the tube are in a position convenient for you.
– Check that the correct interpupillary distance has been set.
– Check that the eyecups have been adjusted in such a way that you can see the full field of view.
– Check that the correct prescription has been set on the diopter scale.
– Check that image quality is the same throughout the entire magnification range.

Balance
– Check that the surgical microscope has been correctly balanced.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7

**S88 floor stand**

Note:
After switching on, the suspension system automatically performs a self-test which takes approx. five seconds.

Xenon illumination system
– A beep sounds after power-on of the system, and stops when the xenon lamp has ignited correctly and if no other error has occurred.
– If the beep does not stop, do not continue to operate the system.
– The xenon illumination is on and the green indicator lamp is lit.

Note:
If the first lamp has failed and the backup lamp is in use (red segment in the switching knob lights up), make sure to have a backup lamp module ready at hand as a precaution.

**Warning!**
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

Change the xenon lamp in good time.

Please note the following guidelines - example:

– If operated for 4 hours/day on 5 days/week, the lamp needs to be exchanged after 25 weeks maximum.
– If operated for 8 hours/day on 5 days/week, the lamp needs to be exchanged after 12 weeks maximum.

Lamp brightness
• Check that the lamp brightness display shows the minimum level (1.0) after power-on of the system.
• Change the lamp brightness across the entire control range, and check that brightness variation has an effect on the surgical field illumination (bright/dark).

Balance setting
– Check that the suspension arm has been properly balanced. When the release button on the surgical microscope is pressed, the effort required to move the arm up or down must be the same.

Limit of the suspension arm's downward movement
– The minimum working distance (height) from the surgical field has been set using the adjustment screw for limiting downward travel.

Stand base
– Check that the locking pedal has been pressed and that the stand is securely locked in position.

Check the accessories

Using the manuals provided, check that the other equipment (surgical microscope, coobservation tube, video system, etc.) is functioning properly.

**Foot control panel**

– Check that the plug of the foot control panel has been connected.

– Check that the power switch of suspension system has been switched on.

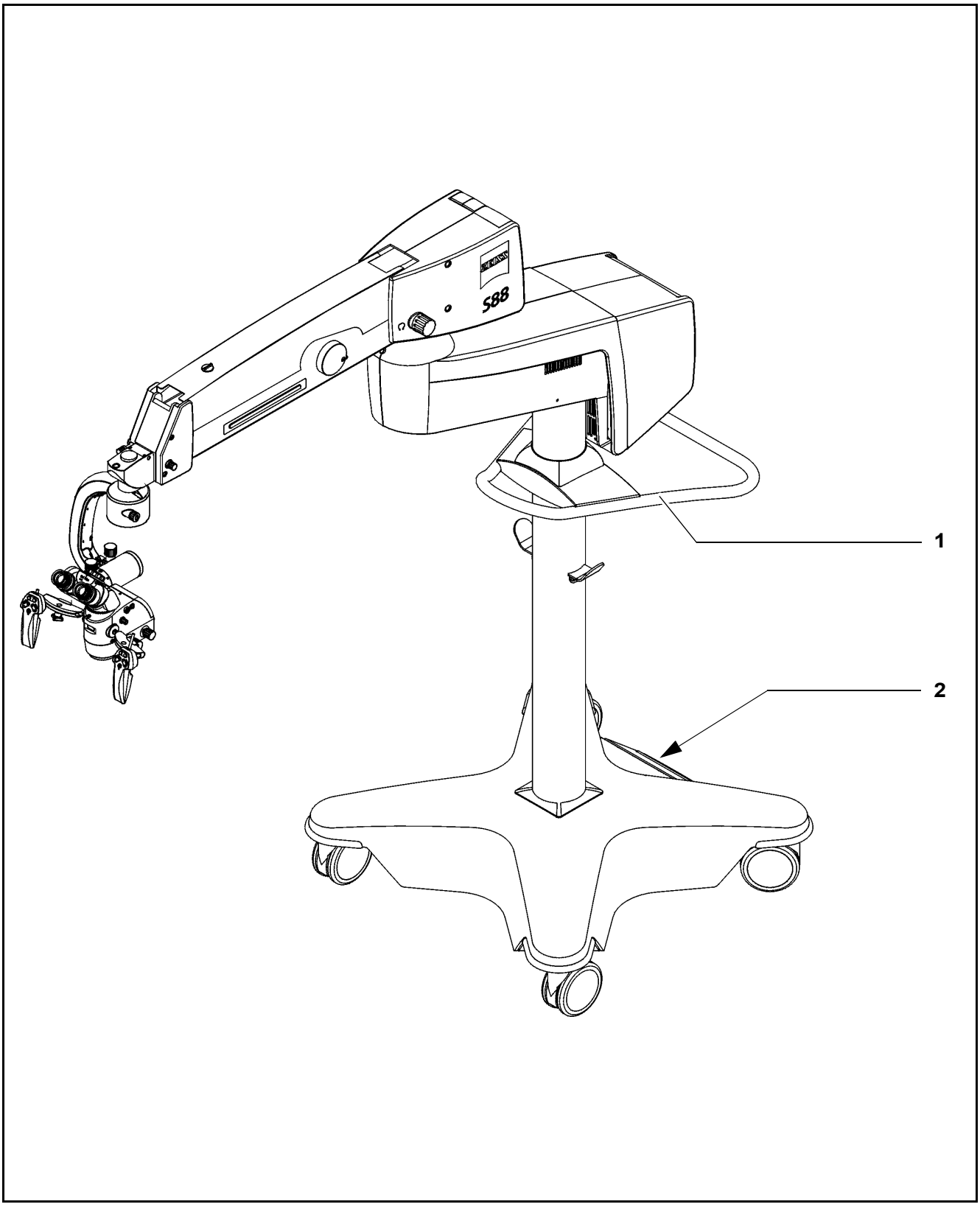
• Check that all functions assigned to the respective keys on the foot control panel are working properly.

# Positioning the S88 floor stand

Note:
Please also read the chapter: "Relocating the stand", page 126.

- Unlock brake tab (2).
- Use maneuvering handle (1) to move the stand to the site of use. Make sure that movement is not obstructed by the power cord and the cable of the foot control panel.

**Caution:**
Press down brake tab (2) and make sure that the stand is securely locked in position and cannot roll away by itself.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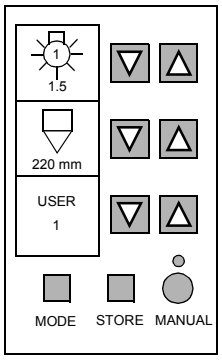
2

# Using the display and key field

## General functions




### Operating the "∇" and "Δ" keys

The "∇" and "Δ" keys have been assigned to the display sections (LCD) located on their left respectively, i.e. they permit you to change the value or setting currently shown in the relevant display.

Every time you press the "∇" key, the displayed value is reduced in predefined steps until its minimum is reached.

Every time you press the "Δ" the displayed value is increased in predefined steps until its maximum is reached.

The "Δ" and "∇" keys have a repeat function, i.e. while you keep one of these keys pressed, the relevant value is automatically incremented/decremented in the predefined steps until its maximum/minimum is reached.

### Operating the row of keys

"MODE" key
Press the "MODE" key to switch from the basic mode to the speed mode. The "MODE" key also brings you back from the speed mode to the basic mode.

In the configuration modes, use the "MODE" key to return to the basic mode.

"STORE" key
The function of the "STORE" key is dependent on the surgical microscope used. For details of the "STORE" key, see the user's manual of the relevant surgical microscope.

"MODE" key and "STORE" key
If you press the "MODE" and "STORE" keys simultaneously, you will get from the basic mode to the configuration mode 1. If you press the "MODE" and "STORE" keys simultaneously while you are in one of the configuration modes, the program jumps to the next configuration mode, and from the last configuration mode back to configuration mode 1, see the illustration "Overview of user interface".

Note:
If you have selected any of the modes and do not press a key in the key field, the program will return to the basic mode after 20 seconds.

"MANUAL" key

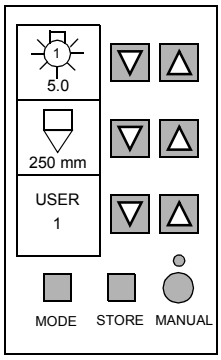
The "MANUAL" key permits you to switch to manual operation. The motorized control functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a fixed setting, the value being shown in the first display.
When the manual mode is activated, the yellow LED is lit and the word "MANUAL" blinks in the third display.

The surgical microscope can no longer be operated via the foot control panel, the handgrips or the display and key field.
In the manual mode, you can only switch the illumination on and off on the foot control panel and release the magnetic brakes by pressing the appropriate keys on the surgical microscope.

The selection of the manual mode is retained even if you turn the power switch of the instrument off and on again.

Press the "MANUAL" key once again to reactivate electronic control; the display in the display and key field then returns to the basic mode.

Basic mode




## Basic mode

The basic mode is always displayed in the normal operating status and after power-on of the system.

In the basic mode, the following settings are displayed, depending on the installed surgical microscope:

| | |
|---|---|
| In the upper display field | the current lamp brightness |
| In the middle display field | for OPMI® Vario on the suspension system: either the working distance or the total magnification |
| In the lower display field | the user ID |

## Setting the user ID (USER)

The lower display field in the basic mode generally shows the current USER, i.e. the user ID selected when the system was last switched off is displayed. When the user is changed, all settings for the newly selected user will be loaded, except the lamp brightness which is always set to the minimum value.

User data records can be stored for a maximum of 9 different users.

Use buttons "∇" and "Δ" assigned to the lower display field to select a user ID between 1 and 9.

Saving parameter settings
As soon as you have entered a parameter setting, it is saved under the current user ID.

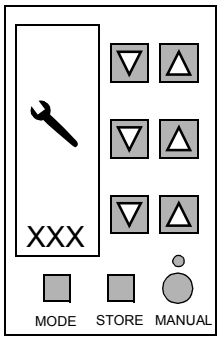
Note:
If possible, each user should be assigned his own user ID under which he can enter and save his specific parameter settings. This permits each user to call up his specific set of parameters via his user ID and to work with these settings.

Note:
Make sure not to change the settings of another user. It is advisable to work only under your own user ID, as all settings are always saved under the currently selected USER.

### Acoustic signals

| | |
|---|---|
| Three successive beeps | – Error message during the software check after power-on of the suspension system.<br>– Error message in the case of an internal system error. |
| One beep | When the focus or zoom position is saved. |
| One beep | When brightness level 1.0 is reached. |
| One beep | After power-on of the suspension system. |
| Intermittent beep | Error of the illumination system. |

### Service display



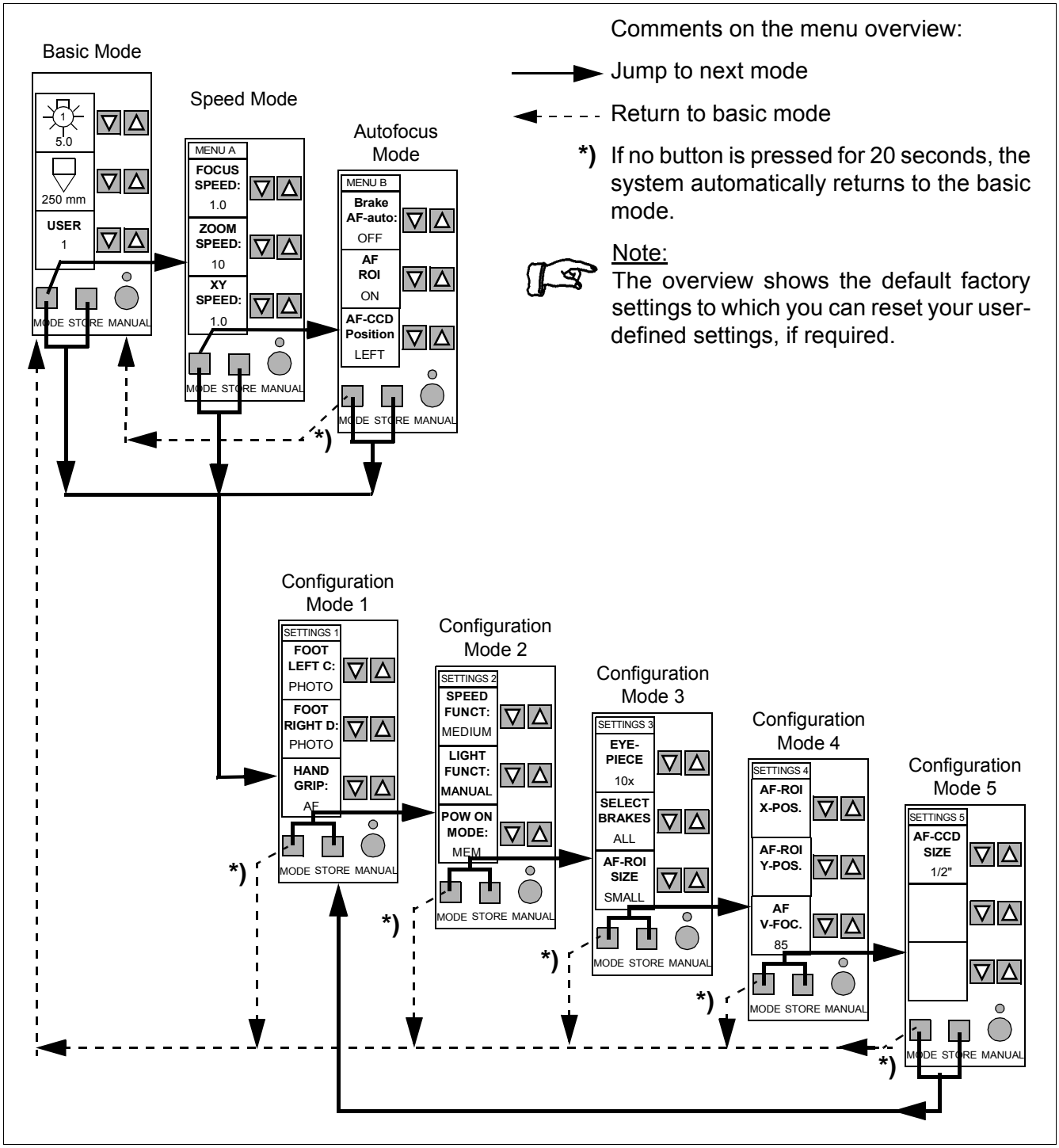

In the event of an error, e.g. during the system check after power-on of the suspension system, an error message appears in the control and display panel: a wrench symbol and an error code (XXX) are displayed and three successive beeps are heard.

Inform the service department, telling them the error code and the serial number of the system.

Motorized control of the surgical microscope is then no longer possible. All microscope functions except recentering of the X-Y coupling can only be operated manually.
However, you can still release the magnetic brakes using the appropriate button on the left and right handgrips of the microscope.

When you press the "MANUAL" key, the surgical microscope can no longer be operated via the foot control panel, the handgrips or the control and display panel.
You can continue using the illumination system, but the lamp brightness is automatically adjusted to a fixed setting. You can use the foot control panel to switch the illumination system on and off.

# OPMI Vario on the suspension system, user interface with SpeedFokus option



**Overview:**
**Control functions for OPMI Vario with SpeedFokus (autofocus).**

| | | |
|---|---|---|
| **Basic mode**<br>see page 138<br>– Setting the lamp brightness<br>– Display of working distance or total magnification, display switchover<br>– Setting the user ID | **Speed mode**<br>**(Menu A)**, see page 145<br>– Setting the speed for focusing<br>– Setting the speed for the zoom function<br>– Setting the speed for the X-Y coupling | **Autofocus mode**<br>**(Menu B)**, see page 147<br>– Automatic focusing after locking of the magnetic brakes (on / off)<br>– Display of the ROI (region of interest) on/off<br>– Entering the video camera orientation (left/right) |
| **Configuration mode 1**<br>**(Settings 1)**, see page 149<br>– Assigning a function to button C of the foot control panel<br>– Assigning a function to button D of the foot control panel<br>– Assigning a function to the freely configurable handgrip buttons | **Configuration mode 2**<br>**(Settings 2)**, see page 152<br>– Setting the focus speed depending on the zoom setting<br>– Setting the brightness depending on the zoom setting<br>– Setting the power-on behavior | **Configuration mode 3**<br>**(Settings 3)**, see page 155<br>– Entering the current eyepiece magnification for the calculation of the total magnification displayed in the basic mode.<br>– Selecting the magnetic brakes to be unlocked by pressing handgrip buttons B<br>– Setting the ROI size |
| **Configuration mode 4**<br>**(Settings 4)**, see page 158<br>– Defining the position of the ROI.<br>– Entering the video focal length | **Configuration mode 5**<br>**(Settings 5)**, see page 159<br>– Entering the size of the video camera's CCD array | |

The control functions are explained in more detail in the following sections.

Note:
The functions of the SpeedFokus (autofocus) option are only displayed in the user interface for OPMI Vario on a suspension system if this option has been actually installed. The special functions of the SpeedFokus (autofocus) option comprise:

– Video-AF mode (MENU B), complete

– AF-ROI SIZE function in configuration menu 3 (SETTINGS 3)

– Configuration menus 4 and 5 (SETTINGS 4 and 5), complete

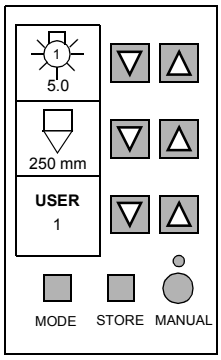
"STORE" key
The focusing and zoom values currently set on the surgical microscope are saved for the user currently selected. The function of the "STORE" key is the same in all modes.
The current focusing and zoom values are stored as focus memory (FOC-MEM) and zoom memory (ZOOM-MEM).
To set the instrument to these stored focusing and zoom values, press keys C and D on the foot control panel or the freely configurable keys on the handgrips, see configuration mode 1.

**Caution:**
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Adjusting the settings
The associated buttons "∇" and "Δ" allow you to change the settings in defined steps.

Saving parameter settings
As soon as you have entered a parameter setting, it is saved under the current user ID.

Basic mode




**Basic mode for OPMI Vario**

The basic mode for OPMI Vario comprises the following functions:

– Setting the lamp brightness

– Switching the display between working distance and total magnification

– Setting the user ID, menu item "USER".
For details, please see page 138

Path: The basic mode is automatically displayed after the instrument has been switched on.

Setting the lamp brightness (OPMI Vario)

This function permits you to set the lamp brightness. In the basic mode, the lamp brightness currently set is shown in the upper display field.

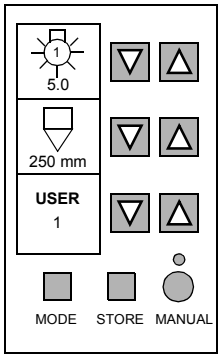
Setting the lamp brightness:
Use the associated buttons "∇" and "Δ" to adjust the lamp brightness. The brightness can be varied in a range from 1 to 10 in steps of 0.5.
The last setting of the lamp brightness is automatically saved under the current user ID.

Notes:

– In the adjustment performed here, you set a fixed basic brightness of the illumination. In configuration mode 2, you can select automatic (AUTO) for "Brightness as a function of the zoom position" (LIGHT FUNCT:).
The automatic function ensures that you have an image of constant brightness across the entire zoom range (0.4 to 2.4). From zoom value 1 onwards, the transmission of the optical system decreases with increasing magnification. The automatic function compensates for this by increasing the lamp brightness appropriately.
If you have selected a relatively high basic brightness for a large field of view (low zoom value), the automatic function is unable to sufficiently compensate for the reduced transmission of the optical system resulting from high zoom values.

– You can also adjust the brightness of the lamp by pressing the appropriate key on the foot control panel or handgrip.
In configuration mode 1, you can assign the increase/reduce brightness function to the freely configurable keys on the handgrip.

Basic mode




Display of the working distance or total magnification (OPMI Vario)
This function permits you to switch between displays.

In the basic mode, either the working distance (in mm) or the total magnification (as a factor) is displayed in the middle display field.
The associated buttons "∇" and "Δ" allow you to switch between these displays.

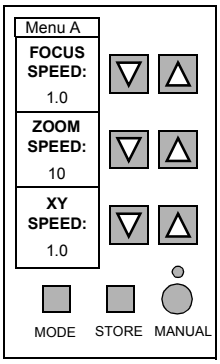
Displaying the working distance:
The working distance is displayed as a symbol and a numeric value which indicates the current working distance in millimeter. The current working distance is displayed in 5 mm steps.

Displaying the total magnification (MAG):
The total magnification of the optical system is displayed as the abbreviation MAG and a numeric value (factor) which indicates the current total magnification in steps of 0.1.The total magnification is calculated by the software. For this purpose, the magnification of the eyepieces currently used must be known to the software. Use configuration menu 3 to enter the current eyepiece magnification.

Setting the user ID
Menu item USER, for details see page 138.

Path: To access the speed mode (MENU A), press the MODE button in the basic mode.
To change to configuration mode 1 (SETTINGS 1), press the MODE and STORE buttons simultaneously.

Speed mode




**Speed mode for OPMI Vario (MENU A)**

This mode permits you to set the adjustment speeds for the following microscope functions:

– Focusing

– Zoom function

– Adjustment of the X-Y coupling

Path: Every time you switch on the system, the basic mode is automatically displayed. Press the MODE button to access the speed mode (MENU A).

Adjusting the settings
The speed mode is the user interface which allows you to set the speeds of the microscope functions.

Each of the three adjustment speeds can be set in a range from 1 min. to 10 max. in steps of 0.5.

Optical systems provide a large depth of field if small zoom values are used. In the case of a large depth of field, the focusing system must travel a large range until the image is in focus. This means that the X-Y coupling must be adjusted over a large range until the required position is reached. This will take some time. A high adjusting speed is therefore a great benefit.
On the other hand, optical systems provide a small depth of field if high zoom values are used. This requires precise positioning of the focusing system in a small range to ensure that the image is in focus. This means that the X-Y coupling must be precisely adjusted within a small range until the required position is reached. A low adjusting speed is of advantage in this case.
Select the adjusting speed for the focus as appropriate for your working method.

Note:
The "SPEED FUNCT" function in configuration mode 2 permits you to select dynamic speed control for focusing and for the X-Y coupling as a function of the zoom setting.
You can select a high, medium or low value for the dynamic change of speed, or deselect dynamic speed control.
If you have already set a high adjustment speed for focusing and the X-Y coupling in the speed mode, dynamic speed control may possibly not be effective across the entire zoom range, as the maximum adjustment speed is reached beforehand. For further details, please see configuration mode 2.

Path: To return to the basic mode, press the MODE button in the speed mode (MENU A), or do not press any button for 20 seconds. To change to configuration mode 1 (SETTINGS 1), press the MODE and STORE buttons simultaneously.

### SpeedFokus autofocus option

The SpeedFokus autofocus option permits you to select and automatically focus on a feature in the ROI (region of interest, measuring field) in the image of the surgical field. Prerequisite for the SpeedFokus (autofocus) option: a suitable video system must be installed on your OPMI Vario surgical microscope on the suspension system, and must be switched on.
The SpeedFokus (autofocus) function is based on the evaluation of the video image contrast: during focusing of the microscope's Varioskop optics, SpeedFokus continuously determines the video image contrast in the selected ROI. In this way, SpeedFokus controls the microscope's Varioskop optics and adjusts it to the point of maximum contrast, corresponding to the point of maximum image definition.

**Caution:**
Glare in the video image may impair the SpeedFokus function.

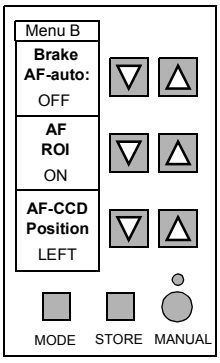
### OPMI Vario: Autofocus mode (MENU B)

The autofocus mode (Menu B) is only displayed if the SpeedFokus (autofocus) option has been installed in your system.

Path: Every time you switch on the system, the basic mode is automatically displayed. Press the MODE button twice to access the autofocus mode (Menu B).

The autofocus mode (Menu B) permits you to make the following settings:

Autofocus mode




– Brake AF-auto, ON / OFF: activating / deactivating automatic focusing after locking of the magnetic brakes
– AF ROI, ON / OFF: activating / deactivating the ROI display on the video monitor
– AF-CCD Position, LEFT / RIGHT: video camera orientation, left / right

Note:
Further settings for the SpeedFokus (autofocus) option can be made in configuration menus 3, 4 and 5 (SETTINGS 3, 4 and 5). For details, please see the description of the configuration menus.

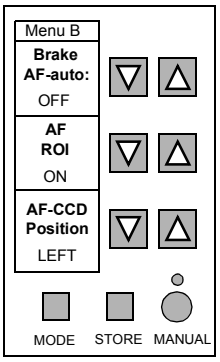
Automatic start of focusing on / off
Menu item "Brake AF-auto, ON / OFF" permits you to activate or deactivate the automatic start of the focusing process.

For changing the position of the surgical microscope, you have to release the magnetic brakes of the suspension system. Press the release button for the magnetic brakes on one of the handgrips. The magnetic brakes of the suspension system are unlocked for as long as you press one of these release buttons.

If you have selected "Brake AF-auto, ON", focusing by the SpeedFokus (autofocus) option will start automatically as soon as the magnetic brakes have been locked, i.e. as soon as you let go of the release buttons.

If you have selected "Brake AF-auto, OFF", focusing by the SpeedFokus (autofocus) option will not start automatically when the magnetic brakes are locked, i.e. when you let go of the release buttons
You can trigger the focusing process using the handgrips or the foot control panel. Prerequisite: AF, the SpeedFokus (autofocus) option, has been selected in foot control panel menu "FOOT LEFT C:" or "FOOT RIGHT D" (for foot control panels with 8 or 14 functions) or in handgrip menu "HANDGRIP:".

Autofocus mode




Note:
You can stop focusing by the SpeedFokus (autofocus) option by pressing one of the release buttons on the handgrips or on the foot control panel (with 8 or 14 functions) during the focusing process.

ROI display on the video monitor on/off
The position and size of the ROI are displayed on the video monitor in the form of a square frame.
Use the "AF ROI, ON / OFF" function to activate or deactivate this display on the video monitor.

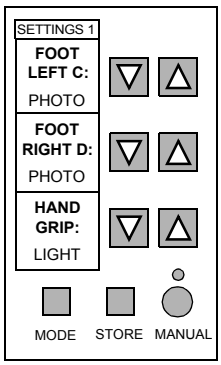
Entering the video camera orientation
If you are using an external video camera, the orientation of the video camera must be known to the SpeedFokus (autofocus) option.

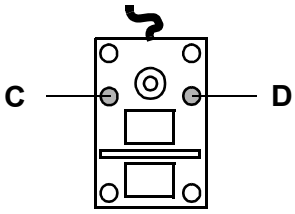
Note:
The OPMI Vario surgical microscope can only be equipped with an external video camera. An integrated video camera is not possible.

**Caution:**
The video image must have the same orientation as the image in the main eyepieces of the surgical microscope.
In addition, SpeedFokus needs the information whether the video camera is connected on the left or right, i.e. whether it is connected to the LEFT or RIGHT main beam path, to enable the function to perform corrections in the right direction during the focusing process. Use the menu item "AF-CCD Position, LEFT / RIGHT" to enter the orientation of the video camera.

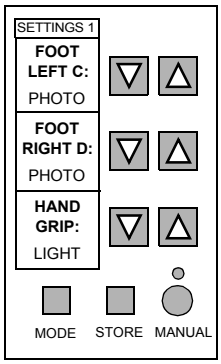
Path: You return to the basic mode if you press the MODE button in the Autofocus mode (MENU B) or if you do not press any button for 20 seconds.
To change to configuration mode 1 (SETTINGS 1), press the MODE and STORE buttons simultaneously.

Configuration mode 1




Configuration mode 1




**Configuration mode 1 for OPMI Vario (SETTINGS 1)**

Configuration mode 1 for the OPMI Vario permits you:

– to assign a function to buttons C and D of the foot control panel, menu items "FOOT LEFT C:" and "FOOT RIGHT D:"

– to assign a function to the freely configurable handgrip buttons, menu item "HANDGRIP:"

Path: After you have switched on the instrument, the basic mode is automatically displayed.
To access configuration mode 1 from the basic mode, simultaneously press the "MODE" and "STORE" keys.

<u>Assigning a function to foot control panel buttons C and D (OPMI Vario)</u>
Buttons C and D of the foot control panel can be configured as required.

The menu items "FOOT LEFT C:" and "FOOT RIGHT D:" permit you to assign one of the following functions to buttons C and D:

| Display | Function of button C or D of the foot control panel | | |
|---|---|---|---|
| XY-RES | XY recentering ("RESET") | | |
| FOC-MEM | Focus memory | pressed for < 2 sec:<br>pressed for > 2 sec: | triggers positioning<br>saves position |
| ZOOM-MEM | Zoom memory | pressed for < 2 sec:<br>pressed for > 2 sec: | triggers positioning<br>saves position |
| PHOTO | Triggering an exposure via the camera interface, i.e. triggers the shutter of a connected 35 mm camera. | | |
| AUX | Triggering an AUX signal via the AUX interface, e.g. to switch an external instrument on or off (see remote control socket on the connector panel of the suspension system). | | |
| AF | Triggering the autofocus option | | |

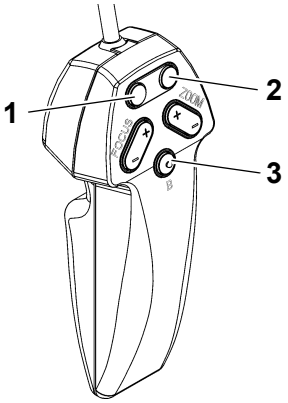
FOOT LEFT C:
Use the upper display and key field (FOOT LEFT C:) to assign one of the possible functions to button C of the foot control panel.

FOOT RIGHT D:
Use the middle display and key field (FOOT RIGHT D:) to assign one of the possible functions to button D of the foot control panel.

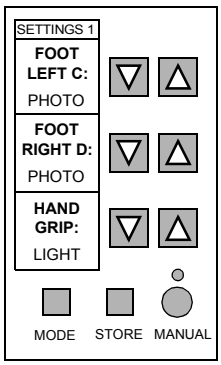
Roll-over procedure:

→ AF → XY-RES → FOC-MEM →
↑ ↓
← AUX ← PHOTO ← ZOOM-MEM ←

If you have assigned FOC-MEM to key C or D of the foot control panel, you can determine by the length of time for which you press the relevant key of the foot control panel during operation whether a positioning run is to be triggered (press the key for less than 2 seconds) or whether the current position is to be saved (press the key for more than 2 seconds).




Configuration mode 1




Assigning a function to the freely configurable handgrip buttons

The two upper buttons (1 and 2) on the left and right handgrips of the OPMI Vario surgical microscope are freely configurable.

Use the menu item "HANDGRIP:" to assign one of the following functions to the handgrip buttons:

| Display | Function of the left button (1) | Function of the right button (2) |
|---|---|---|
| LIGHT | Reducing brightness | Increasing brightness |
| MEM | Focus memory<br>pressed for < 2 sec: triggers positioning<br>Pressed for > 2 sec: saves position | Zoom memory<br>pressed for < 2 sec: triggers positioning<br>Pressed for > 2 sec: saves position |
| PH/AUX | Camera release at the camera interface | Triggering an AUX signal at the AUX interface |
| XY-RES | XY recentering ("Reset") | XY recentering ("Reset") |
| AF | Triggering the autofocus option | |

Roll-over procedure:

→ XY-RES → AF →
↑ ↓
← PH / AUX ← MEM ← LIGHT ←

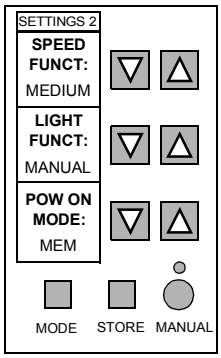
If the memory function (MEM) has been set for buttons (1) and (2) of the handgrips, you can determine whether a positioning run is triggered or whether the position is saved - simply by pressing the buttons for a longer or shorter time.
If you press button (1) for less than 2 seconds, focus positioning is triggered; if you press the button for more than 2 seconds, the current focus

position is saved.
If you press button (2) for less than 2 seconds, zoom positioning is triggered; if you press the button for more than 2 seconds, the current zoom position is saved.

Path: To return to the basic mode, press the MODE button in configuration mode 1 (SETTINGS 1), or do not press any button for 20 seconds.
To change to configuration mode 2 (SETTINGS 2), press the MODE and STORE buttons simultaneously.

## Configuration mode 2 for OPMI Vario (SETTINGS 2)

Configuration mode 2




Configuration mode 2 for the OPMI Vario permits you:

– to set the adjustment speeds of focus and X-Y coupling as a function of the zoom setting, menu item "SPEED FUNCT:"

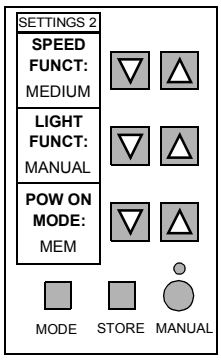
– to set the lamp brightness as a function of the zoom setting, menu item "LIGHT FUNCT:"

– to define the power-on behavior of the system, menu item "POW ON MODE"

Path: The basic mode is automatically displayed after the instrument has been switched on.
To access configuration mode 2 from the basic mode, go via configuration mode 1.
For this, simultaneously press the "MODE" and "STORE" keys twice in succession:
1. Jump from the basic mode to configuration mode 1
2. Jump from configuration mode 1 to configuration mode 2.

Setting the adjustment speeds of focus and X-Y coupling as a function of the zoom setting (OPMI Vario)

Configuration mode 2




Menu item "SPEED FUNCT:" permits you to select dynamic speed control for the X-Y coupling and focus.

The depth of field of the optical system changes according to the zoom setting:

– The depth of field is large for a large field of view (small zoom value), and the focus needs to be adjusted over a large range for focusing the image. This means that the XY-coupling must be adjusted over a large range until the required position is reached. A high adjustment speed should therefore be used in this case.

– The depth of field is small for a small field of view (high zoom value), and the focus needs to be precisely adjusted in a small range for focusing the image. This means that the X-Y coupling must be precisely adjusted within a small range until the required position is reached. A low adjustment speed should therefore be used in this case.

It is therefore advisable to vary the adjustment speeds of the focus and X-Y coupling in accordance with the zoom setting.

The instrument has been factory-adjusted for MEDIUM variation of the adjustment speed as a function of the zoom setting. The best effect of dynamic speed control is achieved if an adjustment speed of <4.0 has been selected in the speed mode.

Note:
The dynamic speed control is based on the basic speed selected for focusing and the X-Y coupling in the speed mode.
If you have already set a high adjustment speed for focusing and the X-Y coupling in the speed mode, dynamic speed control may possibly not be effective across the entire zoom range, as the maximum adjustment speed is reached beforehand.

In the extreme case, if you have set the basic speed for focusing and the X-Y coupling to the maximum value of 10, dynamic speed control will have no effect at all.

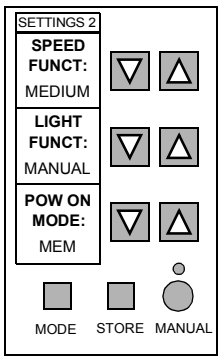
The upper display and key field (SPEED FUNCT:) in configuration mode 2 permits you to select high, medium or low speed adjustment, or none at all.

Roll-over procedure :

→ OFF → HIGH →
↑ ↓
← LOW ← MEDIUM ←

Setting the lamp brightness as a function of the zoom setting (OPMI Vario)

Configuration mode 2




Menu item "LIGHT FUNCT:" permits you to select dynamic control of the lamp brightness depending on the current zoom setting.

The lamp brightness you set in the basic mode is a fixed basic value of the illumination intensity. Configuration mode 2 (LIGHT FUNCT:) permits you to select automatic brightness control (AUTO) depending on the zoom setting. The automatic function ensures uniform brightness of the image over the full zoom range (0.4 to 2.4).

The transmission of the optical system decreases with increasing magnification from zoom value 1 onwards. This is compensated by the automatic function which increases the lamp brightness accordingly.

Use the middle display and key field (LIGHT FUNCT:) in configuration mode 2 to choose between automatically controlled or constant brightness of the lamp:

| AUTO | MANUAL |
|---|---|

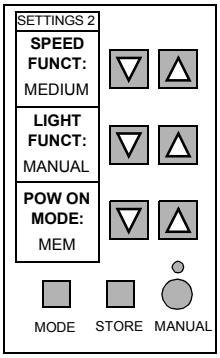
**Warning!**
Starting out from the basic brightness set in the basic mode, dynamic brightness control adjusts the lamp brightness to higher zoom values by increasing it up to the maximum. As a result, the tissue in the surgical field may be subjected to excessive radiation.
You will not be aware of this while looking through the surgical micro-

scope, as the image you see displays constant brightness throughout the zoom range. Only when looking directly at the surgical field will you notice that the brightness of the illumination varies, depending on the zoom setting.

Note:
If you have selected a relatively high basic brightness in the basic mode, the automatic function may not be able to sufficiently compensate for reduced transmission of the optical system.

Defining the power-on behavior of the system (OPMI Vario)
The "POW ON MODE" function permits you to define how the system should behave immediately after it has been switched on.

Configuration mode 2




You have the choice between the following power-on modes:

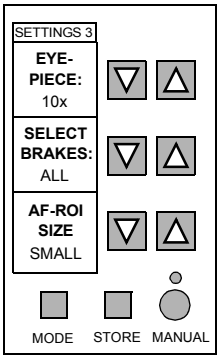
| Display | Function |
|---|---|
| OFF | No positions are changed when you switch on the system. After power-on, you can use the appropriate buttons of the foot control panel or handgrips to **manually** set the focus and zoom to the user-defined values saved in the memory function. |
| PRESET | On power-on, the focus (working distance) and zoom are automatically set to the default factory settings: focus = 250 mm and zoom = 0.5. These two values are also saved in the memory function (FOC-MEM and ZOOM-MEM). |
| MEM | After power-on, the focus (working distance) and zoom are automatically set to the user-defined focus and zoom values saved in the memory function. The values in the memory functions FOC-MEM and ZOOM-MEM can be saved for specific users by pressing the STORE button. |

Roll-over procedure:

→ MEM → OFF →
↑ ↓
← PRESET ←

Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.
To change to configuration mode 3 (SETTINGS 3), press the MODE and STORE buttons simultaneously.

Configuration mode 3




**Configuration mode 3 for OPMI Vario (SETTINGS 3)**

Configuration mode 3 for the OPMI Vario permits you:

– to enter the eyepiece magnification for the calculation of the total magnification, menu item "EYE PIECE:"

– to select the magnetic brakes to be unlocked, menu item "SELECT BRAKES:"

– to select the ROI size, menu item "AF-ROI SIZE"
This menu item is only displayed if the autofocus option has been installed.

Path: Every time you switch on the system, the basic mode is automatically displayed.
To access configuration mode 3 from the basic mode, go via configuration modes 1 and 2 by simultaneously pressing the "MODE" and "STORE" buttons three times successively.

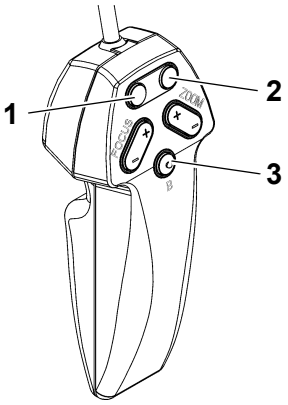
<u>Entering the eyepiece magnification for the calculation of the total magnification</u>

In the basic mode, you can display the total magnification (MAG) of the optical system as a factor in the middle display and key field. The total magnification is calculated by the software. For this purpose, the magnification of the eyepieces currently used must be known to the software.

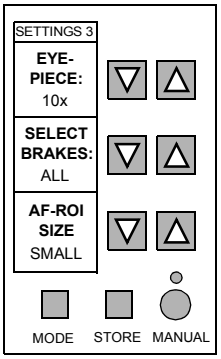
Use menu item "EYE PIECE:" to select one of the eyepiece magnifications available.

Roll-over procedure:

→ 16x → 10x →
↑ ↓
← 12,5x ←




Configuration mode 3



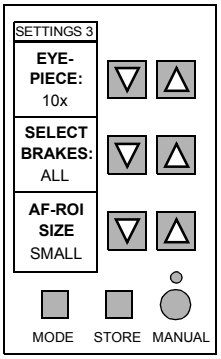

Selecting the magnetic brakes to be unlocked (OPMI Vario)

You can define which magnetic brakes should be unlocked when you press button B (3) of the left and/or right handgrip.

Menu item "SELECT BRAKES:" offers you the following options for selection:

| | |
|---|---|
| XY - Z | The magnetic brakes for X-Y movement and Z movement can be unlocked separately by pressing button B (3) on the left or right handgrip.<br>• To release the magnetic brakes for X-Y movement only: press button B (3) on the left handgrip.<br>• To release the magnetic brakes for Z movement only: press button B (3) on the right handgrip.<br>• To release all magnetic brakes, i.e. the magnetic brakes of the suspension system (for X-Y and Z movements) and of the surgical microscope (for rotary and tilt movements): simultaneously press buttons B (3) on the left and right handgrip. |
| ALL | All magnetic brakes are always unlocked, i.e. the magnetic brakes of the suspension system (for X-Y and Z movements) and of the surgical microscope (for rotary and tilt movements), no matter whether you press button B (3) on the left or right handgrip. |

Configuration mode 3




Setting the ROI size

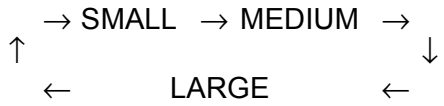
In an OPMI Vario equipped with the SpeedFokus (autofocus) option, the size of the ROI can be set using the menu item "AF-ROI SIZE".
Three different ROI sizes are available for selection:

– SMALL,
– MEDIUM
– LARGE

The default setting for Standard User is the large ROI. You can change the size of the ROI, but the change cannot be saved for the Standard User. For specific users, the ROI size can be set and saved for each user as required.

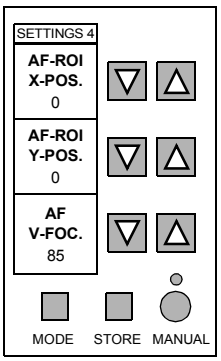
While you are setting the size of the ROI, the ROI is displayed as a square frame in the video image on the monitor. A few seconds after your last action, the frame disappears from the screen.

Roll-over procedure:




Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.
To change to configuration mode 4 (SETTINGS 4), simultaneously press the MODE and STORE buttons in configuration mode 3.

Configuration mode 4




## Configuration mode 4 for OPMI Vario (SETTINGS 4)

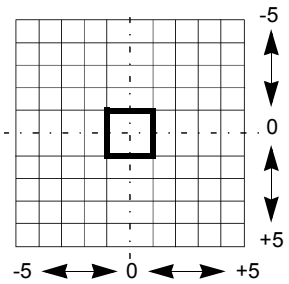
Configuration mode 4 for the OPMI Vario permits you:

– to define the horizontal and vertical ROI position, menu items "AF-ROI X-POS." and "AF-ROI Y-POS."

– to enter the video focal length, menu item "AF V-FOC"

Path: Every time you switch on the system, the basic mode is automatically displayed.
To access configuration mode 4 from the basic mode, go via configuration modes 1, 2 and 3 by simultaneously pressing the "MODE" and "STORE" buttons four times successively.

<u>Defining the position of the ROI</u>
The two menu items "AF - ROI X- POS." and "AF - ROI Y- POS." permit you to define the position of the ROI within the field of view of the microscope.




When you start your system, the ROI is always positioned at the center of the field of view. The ROI is visualized as a square in the graphic display. Starting from the center position in the field of view, the ROI can be moved in all directions by a maximum of 5 steps.

Use the arrow keys to shift the ROI:

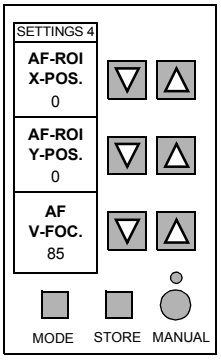
– to the left or right using menu item "AF-ROI X-Pos."

– up or down using menu item "AF-ROI Y-Pos."

<u>Entering the video focal length, menu item "AF-V-FOC"</u>

<u>Note:</u>
This setting is performed during the installation of the SpeedFokus (autofocus) option. It is a camera-specific setting which only needs to be changed when a different video camera is installed.

Configuration mode 4




The video focal length of the video camera currently used must be known to the SpeedFokus (autofocus) option. This menu item is used to specify this camera-specific value to the SpeedFokus (autofocus) option.
This setting must always conform to the technical specifications of the video camera used. The SpeedFokus (autofocus) option does not function properly if parameters have not been correctly set.

You can select the relevant focal length from the values offered.

Roll-over procedure:

→ 50 → 60 →
↑ ↓
← 105 ← 85 ←

Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.
To change to configuration mode 5 (SETTINGS 5), simultaneously press the MODE and STORE buttons in configuration mode 4.

**Configuration mode 5 for OPMI Vario (SETTINGS 5)**

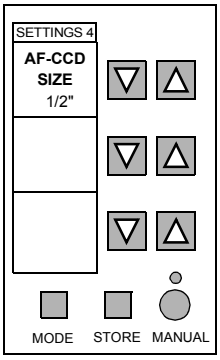
Menu item "AF-CCD SIZE" in configuration mode 5 for the OPMI Vario permits you to enter the size of the CCD array.

Path: Every time you switch on the system, the basic mode is automatically displayed.
To access configuration mode 5 from the basic mode, go via configuration modes 1, 2, 3 and 4 by simultaneously pressing the "MODE" and "STORE" buttons five times successively.

Entering the size of the CCD array, menu item "AF-CCD SIZE"

Note:
This setting is performed during the installation of the SpeedFokus (autofocus) option. It is a camera-specific setting which only needs to be changed when a different video camera is installed.

Configuration mode 5




The size of the CCD array (chip size) of the video camera currently used must be known to the SpeedFokus (autofocus) option. This menu item is used to specify this camera-specific value to the SpeedFokus (autofocus) option.
This setting must always conform to the technical specifications of the video camera used. The SpeedFokus (autofocus) option does not function properly if parameters have not been correctly set.

You can select the relevant size of the CCD array from the values offered.

Roll-over procedure:

→ 1/4" → 1/3" →
↑ ↓
← 1/2" ←

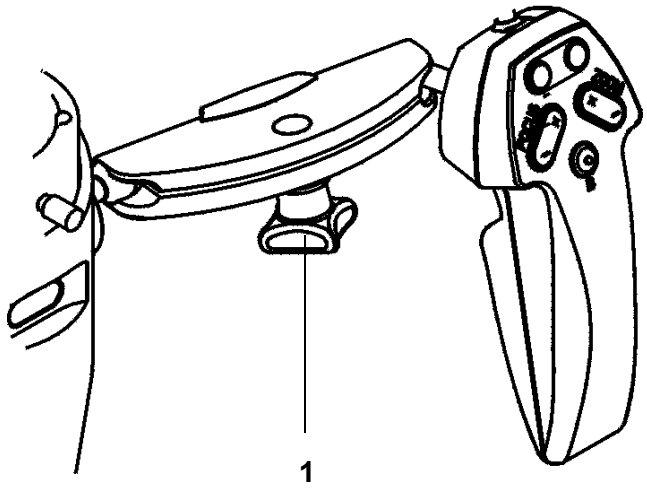
Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.

# Procedure

**Warning!**

– Avoid looking directly into the light source, e.g. into the microscope objective lens or light guide!

- Turn on the system at the power switch of the suspension system.
- Set the required brightness of the surgical field illumination on the suspension system.
- Check the system using the checklist.
- Swing the surgical microscope over the surgical field into an ergonomic position within the working distance.
- Press the actuator button on the X-Y coupling.
  - The X-Y coupling adopts its center position.
  - The focus adopts its initial position in the focusing range.
- Select the lowest magnification (zoom).
- For coarse focusing, look through the eyepieces and lower the surgical microscope until the surgical field comes into focus.
- Select the highest magnification (zoom).
- Look through the eyepieces and activate the focusing function until the image of the surgical field appears sharply focused.
- Select the magnification required (zoom). Look through the eyepieces of the binocular tube. Adjust the eyepieces in such a way that you can see both the edge of the field of view and the microscope image sharply.
- Bring the handgrips into a position convenient for the procedure planned and tighten locking screws (1).
- Switch the system off when not in use.


1

# What to do in an emergency

## Failure of a xenon lamp

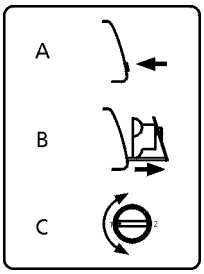
**Caution:**
Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp module and to lamp failure.

Note:
Yellow indicator lamp (5) lights when the lamp has failed. It goes out again after activation and ignition of the backup lamp.

**Switching to the backup lamp**

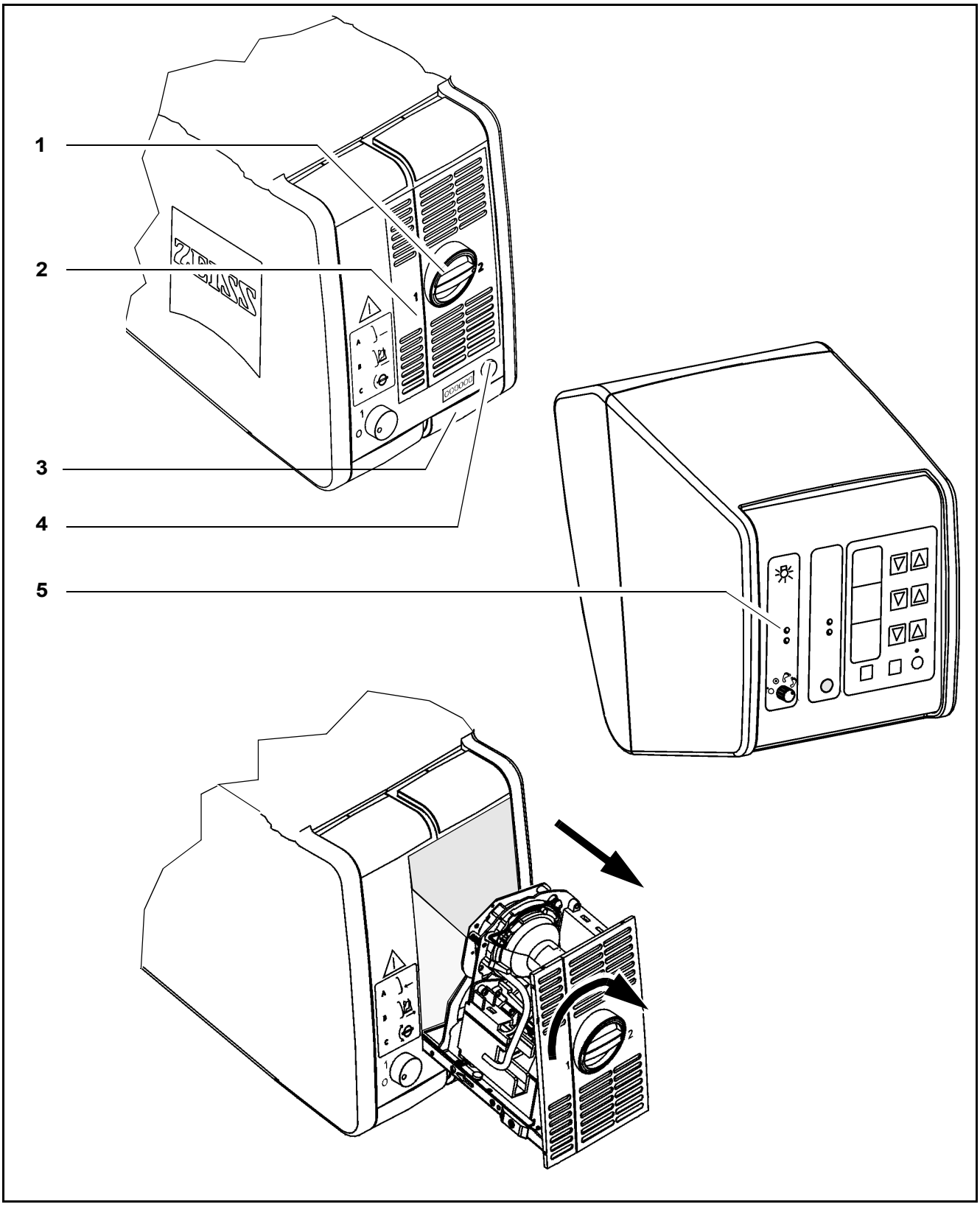
- Turn off the suspension system at the power switch before switching to the backup lamp.

The lamp module contains two xenon lamps. The second lamp is used as a backup lamp which can be swung into the illumination beam path when the first lamp fails.
If the first xenon lamp fails, you can open lamp module (2) as follows:




- Press button (4). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (1) through 180° until it snaps in. This swings the second xenon lamp (backup lamp) into the beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset the service hour counter to "0". Use a pointed object and press it into the recess of reset button (3).
- Turn the suspension system back on at the power switch.

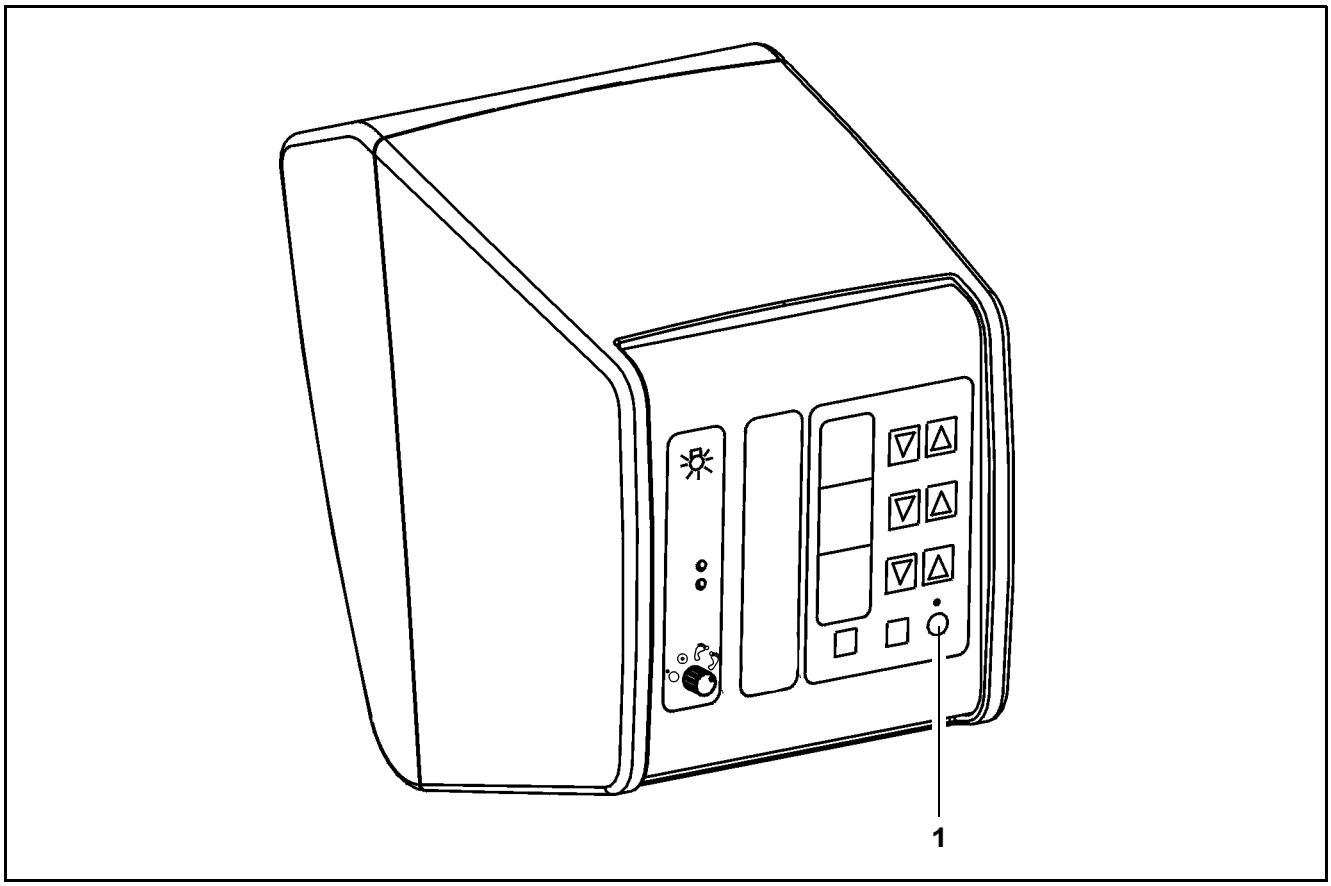
Note:
If the first lamp has failed and the backup lamp is in use (red segment in knob (1) lights up), make sure to have a backup lamp module ready at hand as a precaution.


1
2
3
4
5

## Failure of lamp control

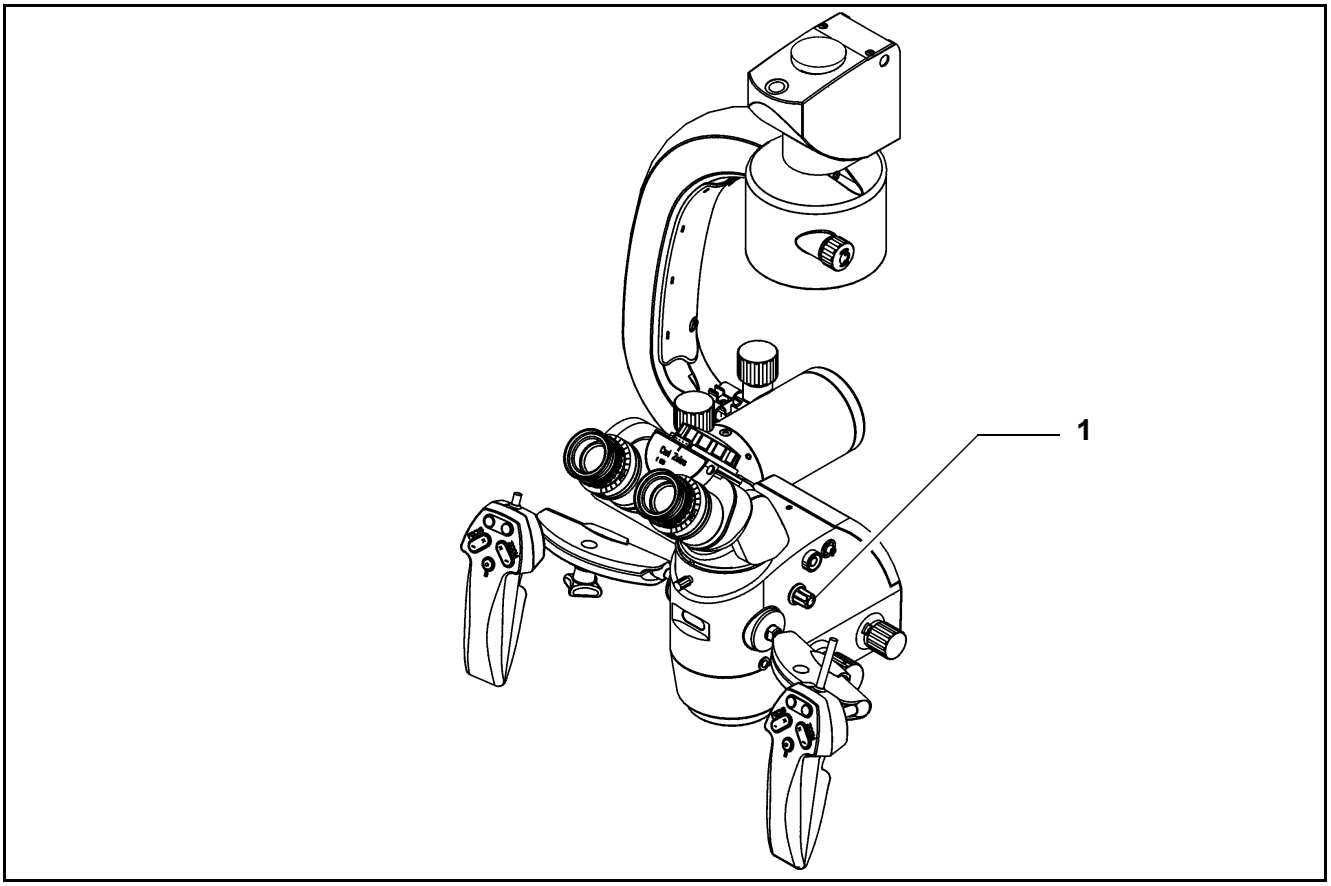
- Press Manual button (1) if brightness control is no longer possible.

Note:
When the manual function has been activated, all electrical control systems are inoperative. The lamp brightness is automatically adjusted to a fixed setting.



## Failure of the zoom function

- Adjust the magnification manually using zoom knob (1).
- If the zoom drive moves into an end position, press the "MANUAL" button on the control panel of your suspension system. The "MANUAL" key permits you to switch to manual operation. The motorized functions of the surgical microscope are deactivated.
  - Continue surgery by manually operating the suspension system and the surgical microscope.

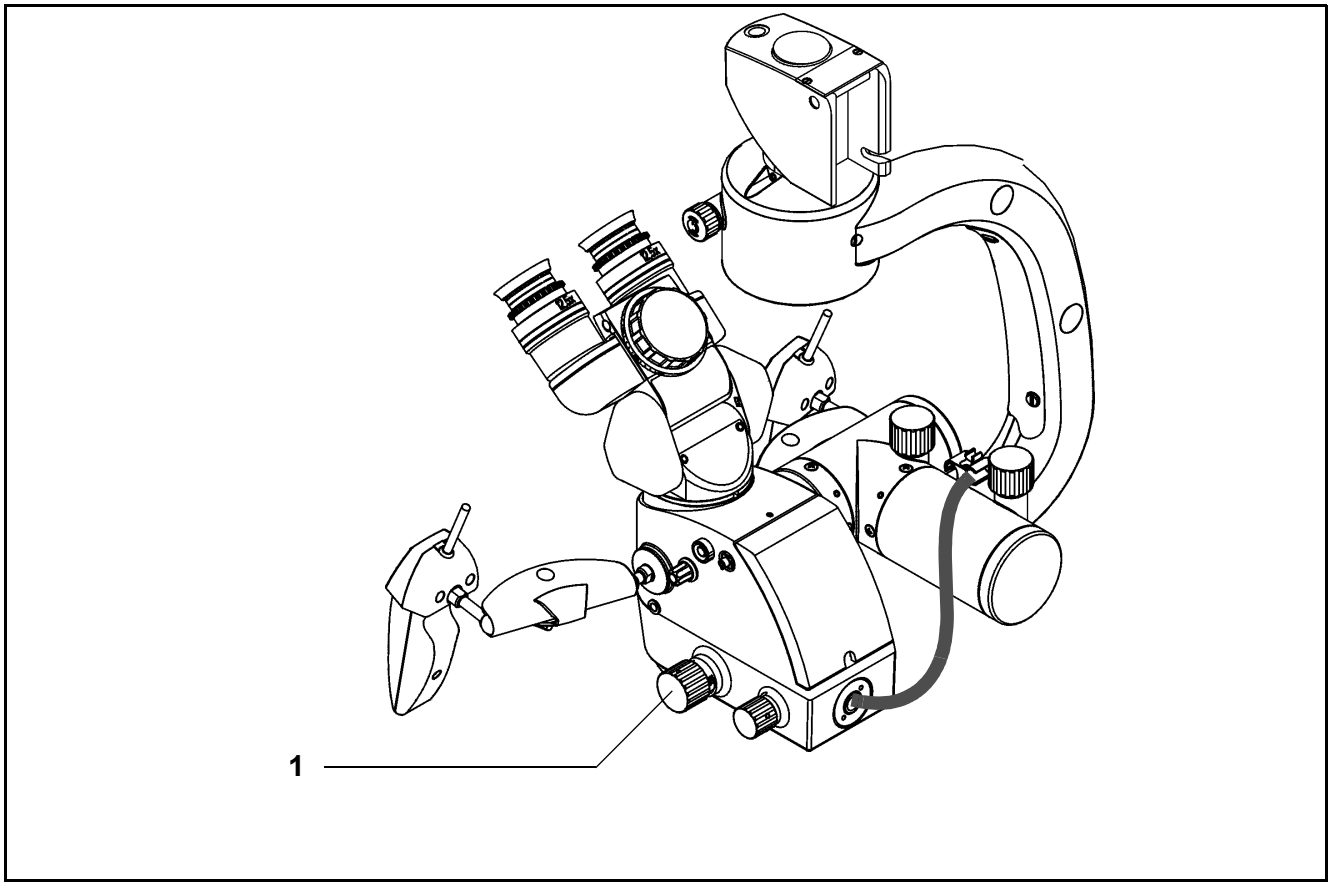


## Failure of the focusing function

- Adjust the focus manually using focusing knob (1).
- If the focus drive moves into an end position, press the "MANUAL" button on the control panel of your suspension system. The "MANUAL" button permits you to switch to manual operation. The motorized functions of the surgical microscope are deactivated.
  - Continue surgery by manually operating the suspension system and the surgical microscope.

  or

  - Manually focus the surgical microscope by moving the suspension arm up or down.



## Failure of magnetic brakes

In the event of a failure of the magnetic brakes (magnetic brakes do not unlock), you can position the microscope manually by overcoming the locking effect of the magnetic brakes.

# Maintenance / Further information

Trouble-shooting 170
Changing the xenon lamp module 178
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## Trouble-shooting

- This instrument is a high-grade technological product. To ensure optimum performance and safe working order of the instrument, its safety must be checked once every 12 months. We recommend having this check performed by our service representative as part of regular maintenance work.
  If a failure occurs which you cannot correct using the trouble-shooting table, attach a sign to the instrument stating it is out of order and contact our service representative.

### OPMI® Vario surgical microscope

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| No function at all. | Suspension system switched off. | Switch on the suspension system. | – |
| | Line power failure. | Contact in-house electrician. | – |
| Surgical field illumination inoperative. | Illumination system of suspension system switched off. | Switch on illumination system of suspension system. See user's manual for suspension system. | – |
| | Defective lamp. | Change the lamp. See user's manual for suspension system. | |
| | Light guide not properly inserted in lamp or microscope. | Insert light guide as far as it will go. | page 104 |
| | Lamp module in suspension system has no contact. | Insert lamp module as far as it will go. | – |
| | Failure of electronics. | Illuminate surgical field using an OR illuminator. Contact service dept. | – |

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| Insufficient surgical field illumination. | Brightness level set too low. | Adjust brightness using the brightness control on the illumination system. See user's manual for suspension system. | – |
| | Light guide not properly inserted in lamp and/or microscope. | Insert light guide as far as it will go. | page 104 |
| | Defective light guide (illumination not uniform). | Contact service dept. | – |
| Zoom system inoperative. | Defective motor. | Adjust magnification manually using the zoom knob. Contact service dept. | page 44 |
| | Zoom system always moves to upper or lower end position. | Switch suspension system to MANUAL mode. Adjust magnification manually using the zoom knob. Contact service dept. | page 44 |
| Focusing system inoperative. | Focus stop button pressed. | Press the focus stop button again. The button must not be lit. | page 44 |
| | Defective motor. | Adjust the working distance manually using the focusing knob. Contact service dept. | page 44 |
| | Focusing system always moves to upper or lower end position. | Switch suspension system to MANUAL mode. Adjust the working distance manually using the focusing knob. Contact service dept. | page 44 |

### OPMI® Vario surgical microscope on suspension system

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| Total magnification is incorrectly displayed. | Eyepiece magnification has not been correctly entered. | Enter current eyepiece magnification at EYEPIECE in configuration menu 3. | |

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| Zoom and focus are not set to stored memory values after power-on of the system. | Power-on mode not correctly selected. | Select the desired power-on behavior at POW ON MODE in configuration mode 2. | |
| Lamp brightness changes with magnification. | No error! Dynamic brightness control has been activated. | Select the mode required at LIGHT FUNCT in configuration mode 2. | |

**SpeedFokus (autofocus) option**

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| SpeedFokus (autofocus) option is inoperative. | Camera control unit (CCU) switched off.<br>Error code display: E20 | • Switch on MediLive CCU. | - - - |
| | Monitor switched off. | • Switch on the monitor. | - - - |
| | Failure of SpeedFokus (autofocus) option | • Contact service dept. | - - - |
| Poor focusing result or none at all. | Focusing of the video camera not matched to focusing of the surgical microscope. | • Focus the microscope image, then the video image. | - - - |
| | Measuring field (ROI) incorrectly positioned. | • Correct the ROI position in configuration mode 4. | page 158 |
| | Suspension system moved during focusing. | • Do not move suspension system during focusing. | - - - |
| | No object in focusing range. | • Reposition surgical microscope. | - - - |
| | No object with sufficient contrast in focusing range. | • Reposition surgical microscope or focus manually. | - - - |

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| Poor focusing result or none at all. | Incorrect entry for camera orientation (left/right), menu item "AF-CCD Position". | • Activate the Video-AF mode and change the video camera orientation. | page 148 |
| | Incorrect entry for the video focal length in menu item "AF-V-FOC.". | • Activate configuration mode 4 and enter the correct focal length. | page 158 |
| | Video camera not correctly oriented. | • Turn video camera so that the video image corresponds to main observer's viewing direction. | - - - |
| Focused video image on monitor, but unfocused image in surgical microscope. | Setting of diopter rings on eyepieces has been changed. | • Set diopter rings to zero or to the correct value. | - - - |
| Focused image in surgical microscope, but unfocused video image on monitor. | Focusing of video camera has not been matched to focusing of surgical microscope. | • Focus the microscope image, then the video image. | - - - |
| Focusing cannot be activated. | Different function assigned to handgrip button 1 or 2. | • Activate configuration mode 1 and assign the AF (Autofocus) function to handgrip button 1 or 2. | page 150 |
| | Different function assigned to button C or D of foot control panel (on foot control panel with 8 or 14 functions). | • Activate configuration mode 1 and assign the AF (Autofocus) function to foot control panel button C or D. | page 149 |

**Suspension systems**

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| No function at all. | Line power failure. | Contact in-house electrician. | - |
| | Power switch of suspension system not switched on. | Press power switch. | - |
| | Automatic circuit breaker in power switch of suspension system has been activated. | Press power switch again. | - |
| Surgical field illumination on microscope not working. | Thermal cut-out activated. | Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again. | - |
| | Selector set in such a way that illumination can be switched on using foot control panel. | Switch on illumination using foot control panel (button A or B). | - |
| | Failure of suspension system electronics. | Illuminate surgical field using an OR illuminator. Contact service dept. | - |
| Yellow indicator lamp in display field blinks. | Defective main and backup lamps. | Change lamp or insert backup lamp module. | - |
| | Defective lamp module. | Illuminate surgical field using an OR illuminator. Contact service dept. | - |
| Surgical field illumination too bright. | Brightness level set too high. | Adjust brightness using control on suspension system or foot control panel. | page 120 |
| | | Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept. | - |
| Lamp brightness cannot be adjusted. | Manual function is activated. (Yellow LED above the button is lit). | Switch off manual function. | - |

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| Motorized focusing and zoom functions of surgical microscope are inoperative. | Manual function is activated. (Yellow LED above the button is lit). | Switch off manual function. | - |
| Suspension arm is in horizontal position and cannot be moved upwards or downwards. | Suspension arm still locked. | Pull out locking device and turn though 180°. | - |
| <br>XXX<br>In combination with three successive beeps and display of the error code (XXX). | – Error message during the software check after power-on of the suspension system.<br>– Error message for an internal system error. | Manual operation is possible.<br>Contact service dept., specify error code and serial no. | - |
| S88 floor stand only: stand wobbles. | Floor not level. Stand base not appropriately positioned. | Slightly turn stand base. Articulated arm should be positioned at a right angle with tilt axis. | |

**Xenon illumination system**

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| Surgical field illumination on microscope not working. | Thermal cut-out activated. | Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again. | - |
| | Selector is set in such a way that illumination can be switched on using the foot control panel. | Switch on illumination using the foot control panel (button A or B). | - |
| | Defective xenon lamp. | Switch to backup lamp. | - |
| | | Keep a new xenon backup lamp module ready at hand. | - |
| | Xenon lamp module has no contact. | Insert xenon lamp module as far as it will go. | - |
| | Failure of suspension system electronics. | Illuminate surgical field using an OR illuminator. Contact service dept. | - |
| Insufficient surgical field illumination. | Brightness level set too low. | Adjust brightness on the suspension system's display field or using the foot control panel. | Page 50 |
| | Aged xenon lamp. | Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. | |
| | | Change xenon lamp module. | page 178 |
| Surgical field illumination too bright. | Brightness level set too high. | Adjust brightness using the control on the suspension system or the foot control panel. | Page 50 |
| | | Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept. | - |

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| No surgical field illumination. | Xenon lamp does not ignite. | Switch off illumination on suspension system.<br>Illuminate surgical field using an OR illuminator.<br>Contact service dept. | -- |
| Xenon lamp is lit, but beep sounds intermittently. | Defective lamp control system. | Switch off illumination on suspension system.<br>Illuminate surgical field using an OR illuminator.<br>Contact service dept. | -- |

**Video monitor**

| Problem | Possible cause | Remedy | See |
|---|---|---|---|
| No imge display. | Main switch is switched off. | Switch on the main switch. | - |
| | Power cable not correctly plugged in. | Plug in the power cable. | - |
| Displayed message "NO SIGNAL" | No signal source connected. | Connect a signal source. | - |
| | No camera connected. | Connect a camera. | - |
| | Connected video cable is defective. | Connect an intact video cable. | - |
| Image is not centered. | A signal source is present on the VGA port, and no automatic image adjustment has been performed. | Perform automatic image adjustment. | page 78 |
| Image is too dark or too bright. | A signal source is present on the VGA port, and no automatic image adjustment has been performed. | Perform automatic image adjustment. | page 78 |

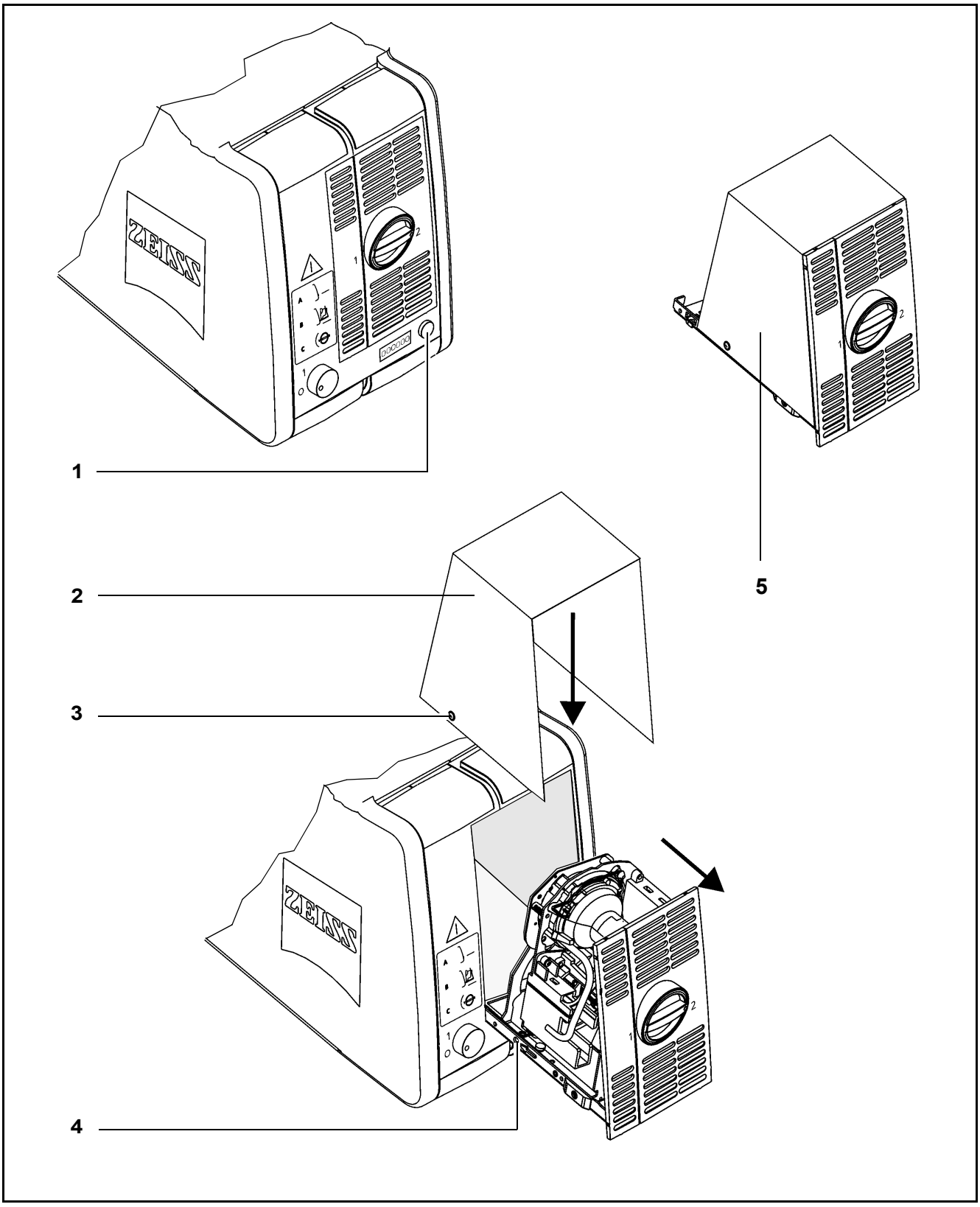
## Changing the xenon lamp module

**Warning!**
The lamp module must only be changed by appropriately trained personnel.
Improper handling of the xenon lamp may lead to damage or injury. Please observe the following points:

- First switch off the suspension system at the power switch.
- Only change the lamp module after it has cooled down completely! In the event of a malfunction, there is a risk of explosion due to the high pressure inside the lamp. The hot surface of the xenon lamp may also cause burns.
- Only change the module after switching off the system. The igniter produces high voltage when the system is on.
- Press button (1). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Slide the original transport case (2) over the module, making sure that bolt (3) engages in bore (4). This unlocks the stop.
- Remove the old module and install the new lamp module by proceeding in the reverse order.
- Check the function of the xenon lamp and backup xenon lamp.

Pack the old lamp module (5) in the transport package of the new lamp module. Fill in the enclosed return card and send the old lamp module to the nearest Carl Zeiss service agency.

Note:
- Only use the original transport case (2) as it also provides explosion protection, should xenon lamps be defective.


1
2
3
4
5

## Adjusting the monitor arm

If the TFT monitor does not remain in place in the required position, you can increase the resistance of the following components:

Resistance on the carrier arm (left/right)

- Slightly tighten screw (1) of the carrier arm by turning it clockwise using an M5 hex key.

Resistance on the suspension arm (left/right)

- Remove plastic cover (2) on the suspension arm joint.
- Loosen screw (4) on the carrier arm by turning it counterclockwise using an M2.5 hex key.
- Tighten adjustment screw (3) of the suspension arm by turning it clockwise until the required friction has been obtained.
- Firmly retighten screw (4) on the carrier arm by turning it clockwise using an M2.5 hex key.
- Reattach plastic cover (2).

Resistance on the gas pressure spring (upward/downward)

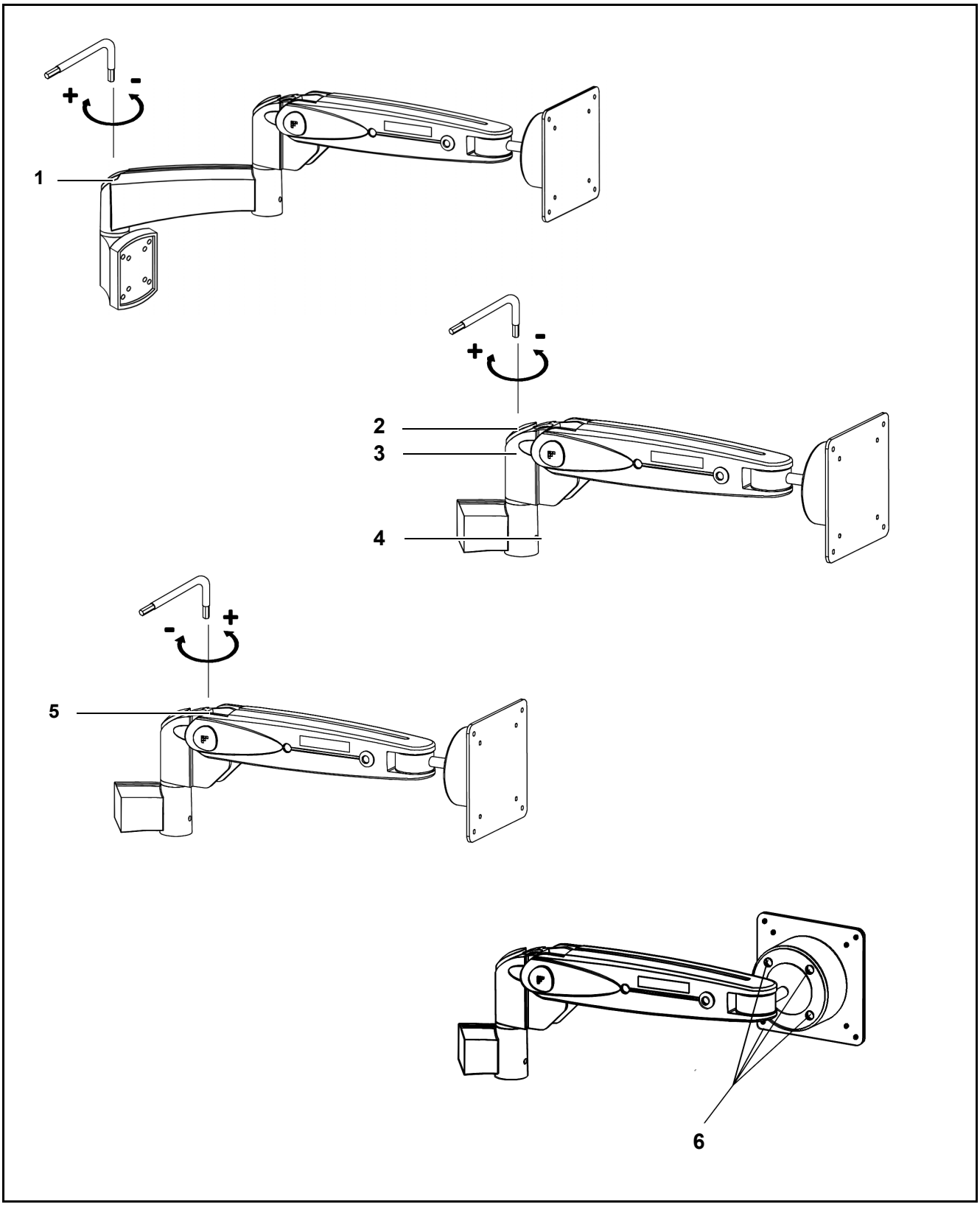
- For correct adjustment of the gas pressure spring, align the carrier and suspension arms in a horizontal position.
- Tighten setting screw of the gas pressure spring (5) by turning it **counterclockwise** with an M5 hex key until the suspension arm with the TFT monitor no longer moves downward by itself.

Note:
If the suspension arm with the TFT monitor continues to move downward, the gas pressure spring is defective. Notify our service representative.

Resistance on the ball joint

- Tighten all of the four securing screws (6) of the ball joint by turning them clockwise until the TFT monitor remains in the required position.

Note:
After adjustment, please check whether the TFT monitor remains in the required position.


+
-
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4
-
+
5
6

## Magnifications / Fields of view

If the magnification factor $\gamma$ of the zoom system is known, you can calculate the total magnification of the surgical microscope. The following equation is used to determine the total magnification:

$$M_T = \frac{f_{tube}}{f_{obj}} \cdot \gamma \cdot M_{eye}$$

Where:

$f_{tube}$ is the focal length of the binocular tube

$f_{obj}$ is the focal length of the main objective lens (does not correspond to working distance!)

$\gamma$ is the magnification factor of the zoom system

$M_{eye}$ is the magnification of the eyepiece

Example:

$f_{tube}$= 170 mm, $f_{obj}$ = 300 mm, $\gamma$ = 1.6 and $M_{eye}$ = 12.5 x.

The resulting total magnification is:

$$M_T = \frac{170\ mm}{300 mm} \cdot 1.6 \cdot 12.5 = 11.3$$

If the total magnification of the surgical microscope $M_T$ is known, you can use the formula

$$FoV_D = \frac{FoVN \cdot M_{eye}}{M_T}$$

to calculate the field of view diameter $FoV_D$ of the surgical microscope. The field of view diameter is the diameter of the circular surgical field which can be seen through the eyepieces.
FoVN in the above formula stands for the field of view number of the eyepiece.

By entering the value MT = 11.3 in the formula, we obtain the following field of view diameter for 12.5x eyepieces with a field of view number FoVN of 18 mm:

$$FoV_D = \frac{18\ mm \cdot 12.5}{11.3} = 19.9\ mm$$

Notes:

– Field of view numbers:
  10x widefield eyepiece: FoVN 21
  12.5x widefield eyepiece:FoVN 18

– With the Varioskop objective lens integrated in the OPMI Vario, there is a considerable difference between the working distance displayed and the focal length of the Varioskop objective lens. See table page 197.

– If the OPMI Vario is installed on the S8 suspension system, the suspension system´s LCD shows the total magnification of the microscope.

## Care of the unit

**Warning!**
If possible, the systems and accessories should be cleaned immediately after use. Contaminations should not be allowed to dry on the objects, as this would make cleaning and disinfecting more difficult.
If possible, machines should be used for disinfecting and cleaning. For details, please also see the relevant notes on sterilization equipment.

### Cleaning optical surfaces

The multi-layer T* coating of the optical components (e.g. eyepieces, objective lenses) ensures optimum image quality.
Image quality is impaired by even slight contamination. To protect the internal optics from dust, the system should never be left without the objective lens, binocular tube and eyepieces. After use, cover the system to protect it from dust. Always store optical components and accessories in dust-free cases when they are not being used.

Clean the external surfaces of optical components as required:

**Caution:**
Do not use any chemical detergents or aggressive substances. These may damage the optical surfaces.

- Remove coarse dirt (splashes of blood etc.) using distilled water to which a dash of household dish-washing liquid has been added. Wipe the surfaces only with a damp, under no circumstances with a wet cloth.
  Any remaining marks can be easily removed using the following aids.
- For thorough cleaning of optical surfaces, use the optics cleaning set (Cat. No. 1216-071) or damp optics cleaning wipes (available from specialized dealers).
- Remove minor contaminations such as dust, streaks, etc. using a clean microfiber cleaning cloth (available from specialized dealers or under Cat.No. 1254-655).

Auxiliaries from Zeiss: **optics cleaning set, Cat. No. 1216-071**

Suitable for the cleaning of objective lenses and eyepieces of the surgical microscope at regular intervals.

### Fogging of optical surfaces

To protect the eyepiece optics from fogging, we recommend using an anti-fogging agent.

Note:
Anti-fogging agents provided by eyecare professionals for use with eyeglass lenses are also suitable for Zeiss eyepieces.

- Please observe the instructions for use supplied with each anti-fogging agent.

Anti-fogging agents do not only ensure fog-free optics. They also clean the eyepiece optics and protect them against dirt, grease, dust, fluff and fingerprints.

### Cleaning mechanical surfaces

All mechanical surfaces of the equipment can be cleaned by wiping with a moist cloth. Do not use any aggressive or abrasive cleaning agents.

Wipe off any residue with a mixture of 50% ethyl alcohol and 50% distilled water plus a dash of household dish-washing liquid.

## Sterilization

The asepsis sets available from Carl Zeiss contain rubber caps, sleeves and handgrips which can be sterilized in autoclaves. We recommend the following program for sterilization:

| | |
|---|---|
| Sterilization temperature: | 134° C |
| Sterilization time: | 10 minutes |

Sterile single-use drapes are available to cover the system.

Note:
When draping the system, make sure there is enough slack in the drapes to allow for movement of the microscope carrier and surgical microscope. It is especially important that the drapes are completely loose around the handgrips. The surgeon must be able to operate the controls through the drape.

## Disinfecting the control keys

To be able to use the system in the OR, for example, it may be necessary to disinfect the control keys. We recommend using MELISEPTOL disinfectant solution (B. Braun, Melsungen AG). Carl Zeiss keeps MELISEPTOL in stock, and you can also obtain it locally in many countries from representatives of B. Braun, Melsungen AG.

**Warning!**

– Wear disposable plastic gloves to prevent skin contact with the disinfectant.

– MELISEPTOL is inflammable (flame point at 31 °C). Please read the product information from B. Braun, Melsungen AG.

To apply MELISEPTOL, proceed as follows:

- Switch off the unit before disinfecting.
- Apply the disinfectant across the entire surface of the control panel. Do not let any disinfectant seep into the unit.
- Leave the disinfectant on the unit for approx. 30 minutes.
- Then carefully wipe the disinfectant off the surface using a sterile, lint-free cloth.
- Dispose of the gloves and cloth as normal waste.

You can obtain the following articles from Carl Zeiss:

| | Cat. No. |
|---|---|
| 1 l MELISEPTOL in vario bottle | 000000-0103-907 |
| MELISEPTOL HBV spray, 250 ml | 000000-0103-910 |
| MELISEPTOL HBV cloths | 000000-0103-911 |
| Disposable gloves: | |
| Size 1 (large) size 8-9 | 000000-0117-736 |
| Size 2 (medium) size 7-8 | 000000-0117-737 |

### Asepsis

| Description | Qty | Cat. No. |
|---|---|---|
| VisionGuard replacement lenses | 20 | 306001-0000-000 |
| VisionGuard lens protector | 10 | 306002-0000-000 |
| Drape, long version | 5 x | 306071-0000-000 |
| Drape, short version | 5 x | 306070-0000-000 |
| Sterile sleeves for handgrips | 20 x | 326088-0000-000 |
| Sterilizable rubber caps for control knobs on OPMI: | | |
| Zoom (12 mm) | 6 x | 305810-9002-000 |
| Spot illumination (22 mm) | 6 x | 305810-9001-000 |
| Focus (27 mm) | 10 x | 305810-9008-000 |
| Sterilizable rubber caps for control knobs on support arm: | | |
| Balance setting knob, front-to-back tilt (27 mm) | 10 x | 305810-9008-000 |
| Balance setting knob, lateral tilt (27 mm) | 10 x | 305810-9008-000 |
| Friction adjustment knob, microscope rotation (22 mm) | 6 x | 305810-9001-000 |
| Asepsis cap for PD adjustment on 180° tiltable tube | 6 x | 305810-9003-000 |
| Sterilizable rubber cap for 45° tiltable tube | 6 x | 305810-9001-000 |

# Ordering data

### OPMI® VARIO surgical microscope

| Description | Weight [kg] | Cat. No. |
|---|---|---|
| OPMI® VARIO surgical microscope incl. suspension | 8.70 | 1026-700 |
| Coupling for OPMI VARIO | 0.80 | 1026-772 |
| S light guide, 2.5m, with 90° adapter | - | 303481-9225 |
| Dust cover, blue with Zeiss logo | - | 1055-278 |
| Tiltable binocular tube, f=170 mm, 180° | 0.89 | 303791- 0000 |
| 12.5x push-in widefield eyepiece, asph. (2x) | 0.14 | 305543- 0000 |

### S88 floor stand

| Description | Cat. No. |
|---|---|
| S88 floor stand | 305952-9940-000 |
| Coupling for VARIO | 000000-1026-772 |
| Xenon illumination system | 000000-1174-212 |
| S light guide, 2.5 m | 303481-9225-000 |
| Replacement lamp module complete with 2 xenon lamps in transport container and with return card; in exchange for a returned module with defective xenon lamps | 304977-9036-700 |
| Xenon lamp module complete with 2 xenon lamps (new component) | 304977-9036-000 |
| Foot control panel 2 with 14 functions, 3m cable, longitudinal orientation of focus and zoom | 304979-9030-000 |
| Foot control panel 2 with 14 functions, 3m cable, transverse orientation of focus and zoom | 304979-9035-000 |

### SpeedFokus autofocus option for OPMI Vario on S88 floor stand

| Description | Cat. No. |
|---|---|
| SpeedFokus (autofocus) option in S88<br><br>Prerequisite:<br>Previously installed video system. | 000000-1227-873 |

### Upgrade kits for S88 floor stand

| Description<br><br>(UC = upgrade component) | Cat. No. |
|---|---|
| UC locking mechanism compl., S88 floor stand | 000000-1287-741 |
| UC SpeedFokus (autofocus) in S88 | 000000-1308-545 |
| 15" TFT monitor with arm and instrument tray for S88 floor stand | 305953-9030-000 |

# Spare parts

### OPMI Vario surgical microscope

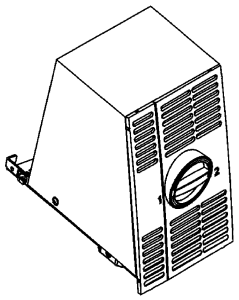
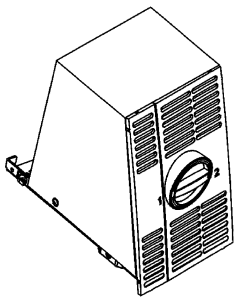
| Description | Cat. No. |
|---|---|
| Light guide, 2.5 m long, with 90° adapter | 30 34 81-9225 |

### Video

| Description | Cat. No. |
|---|---|
| Y/C connection cable, 2 m long (2x) | 301687-9102 |
| Y/C extension cable, 12.5 m long | 301687-9110 |
| BNC (VBS) connection cable, 10 m long (2x) | 301687-9101 |
| Y/C connection cable (plug - plug), 5 m long | 300-281 |
| Y/C extension cable, 5 m long | HAMA<br>Cat. No. 42734 |

### Suspension systems - xenon illumination system

### Xenon illumination system

| | Description | Cat. No. |
|---|---|---|
|  | Complete replacement lamp module with 2 xenon lamps in transport container and with return card; in exchange for a returned module with defective xenon lamps | 304977-9036-700 |
|  | Complete xenon lamp module with 2 xenon lamps (new component) | 304977-9036-000 |

## Accessories

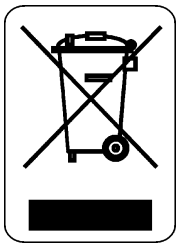
**Caution:**
Operate the system using only the accessories included in the delivery package. If you wish to use other accessories, make sure that Carl Zeiss Surgical GmbH or the manufacturer of the accessories has proved and confirmed that these accessories meet the respective safety standards and can be used without risk.

| Description | Weight [kg] | Cat. No. |
|---|---|---|
| X-Y coupling incl. X-Y power cable | 4.65 | 1043-103 |
| Coupling for OPMI with spigot mount | 0.70 | 305952-8030 |
| Double iris diaphragm | 0.09 | 303354-0000 |
| Dovetail mount for the installation of micromanipulators on OPMI Vario | | 1209-639 |
| Adapter plate for laser micromanipulators with 48 mm dia. | | 1309-933 |
| Dovetail mount for the installation of Zeiss MM6 micromanipulator on OPMI Vario | 0.05 | 1079-870 |
| Retrolux® illumination module | 0.7 | 303338-9901 |
| Transport case for OPMI Vario, foot control panel and Retrolux® illumination module | | 303338-9800 |
| Stereo bridge | 1.10 | 1040-085 |
| Rotatable dovetail for binocular tubes | 0.17 | 301007-0000 |
| Tiltable binocular tube, f=170 mm, 180° | 0.89 | 303791-0000 |
| Straight binocular tube, f=170mm | 0.48 | 303765-0000 |
| Inclined binocular tube, f=170mm, 45° | 0.60 | 303784-0000 |
| Sleeves for tubes with screw thread (2x) | 0.02 | 305542-0107 |
| 10x push-in widefield eyepiece (2x) | 0.26 | 305542-0000 |
| 12.5x push-in widefield eyepiece (2x) | 0.26 | 305543-9901 |
| Stereo coobservation module with two pivot joints | 0.95 | 1063-869 |
| Long mono coobservation tube | 1.20 | 302706-0000 |
| Short mono coobservation tube | 0.17 | 1079-519 |

| Description | Weight [kg] | Cat. No. |
|---|---|---|
| Beam splitter 50/50 | 0.50 | 301513-9902 |
| Beam splitter 20/80 | 0.50 | 301503-9901 |
| Water-proof foot control panel 2 with 14 functions (6 m cable) | 4.90 | 304979-9030 |
| Water-proof foot control panel 2 with 14 functions (3m cable) | 4.60 | 304979-9050 |
| Video objective lens f=50mm, C-mount (for 1/3" 1 CCD) | 0.37 | 301677-9050 |
| Video objective lens f=60mm, C-mount (for 1/2" 1 CCD, 1/3" 1 CCD, 1/3" 3 CCD) | 0.37 | 301677-9060 |
| Video objective lens f=85mm, C-mount (for 1/2" 1 CCD, 1/2" 3 CCD) | 0.37 | 301677-9085 |
| Video objective lens f=105mm, C-mount (for 1/2" 1 CCD, 1/2" 3 CCD, 2/3" 1 CCD) | 0.41 | 301677-9105 |
| Video objective lens VOL 442 | | 301681-9010 |
| Video objective lens VOL 802 | | 301681-9008 |
| MediLive Primo with C-mount adapter PAL | 6.40 | 308203-9100 |
| MediLive Primo with C-mount adapter NTSC | 6.40 | 308203-9150 |
| MediLive Primo with compact camera PAL | 6.40 | 308203-9110 |
| MediLive Primo with compact camera NTSC | 6.40 | 308203-9160 |
| MediLive Trio 3 CCD mono PAL for C-mount | 5.00 | 1309-965 |
| MediLive Trio 3 CCD mono NTSC for C-mount | 5.00 | 1309-966 |
| MediLive Trio 3 CCD mono PAL for VOL | 5.00 | 1309-963 |
| MediLive Trio 3 CCD mono NTSC for VOL | 5.00 | 1309-964 |
| Canon EOS 10D digital SLR camera | 0.92 | 1229-580 |
| Photo adapter f=340 T2 | 0.42 | 1022-973 |
| SpeedFokus for OPMI Vario S88,S8,S81 | | 1227-873 |
| Standard cable set, external video rack | | 1294-229 |
| S88 instrument tray, complete | | 1352-729 |

# Disposal

**User information**
**on the disposal of electrical and electronic devices**



This symbol means that the product must not be disposed of as normal domestic waste.
The correct disposal of electrical or electronic devices helps to protect the environment and to prevent potential hazards to the environment and/or human health which may occur as a result of improper handling of the devices concerned.
For detailed information on the disposal of the product, please contact your local dealer or the device manufacturer or its legal successor. Please also note the manufacturer's topical information on the internet. In the event of resale of the product or its components, the seller is required to inform the buyer that the product must be disposed of in accordance with the applicable national regulations currently in force.

**For end customers in the European Union**

Please contact your dealer or supplier if you wish to dispose of electrical or electronic devices.

**Information on disposal in countries outside the European Union**

This symbol is only applicable in the European Union. For the disposal of electrical and electronic devices, please observe the relevant national legislation and other regulations applicable in your country.

# Technical data

Technical data of OPMI VARIO 197
Technical data of S88 floor stand 198
Ambient requirements 205
CE conformity 205
Changes to the system 205

# Technical data of OPMI VARIO

### OPMI® VARIO surgical microscope

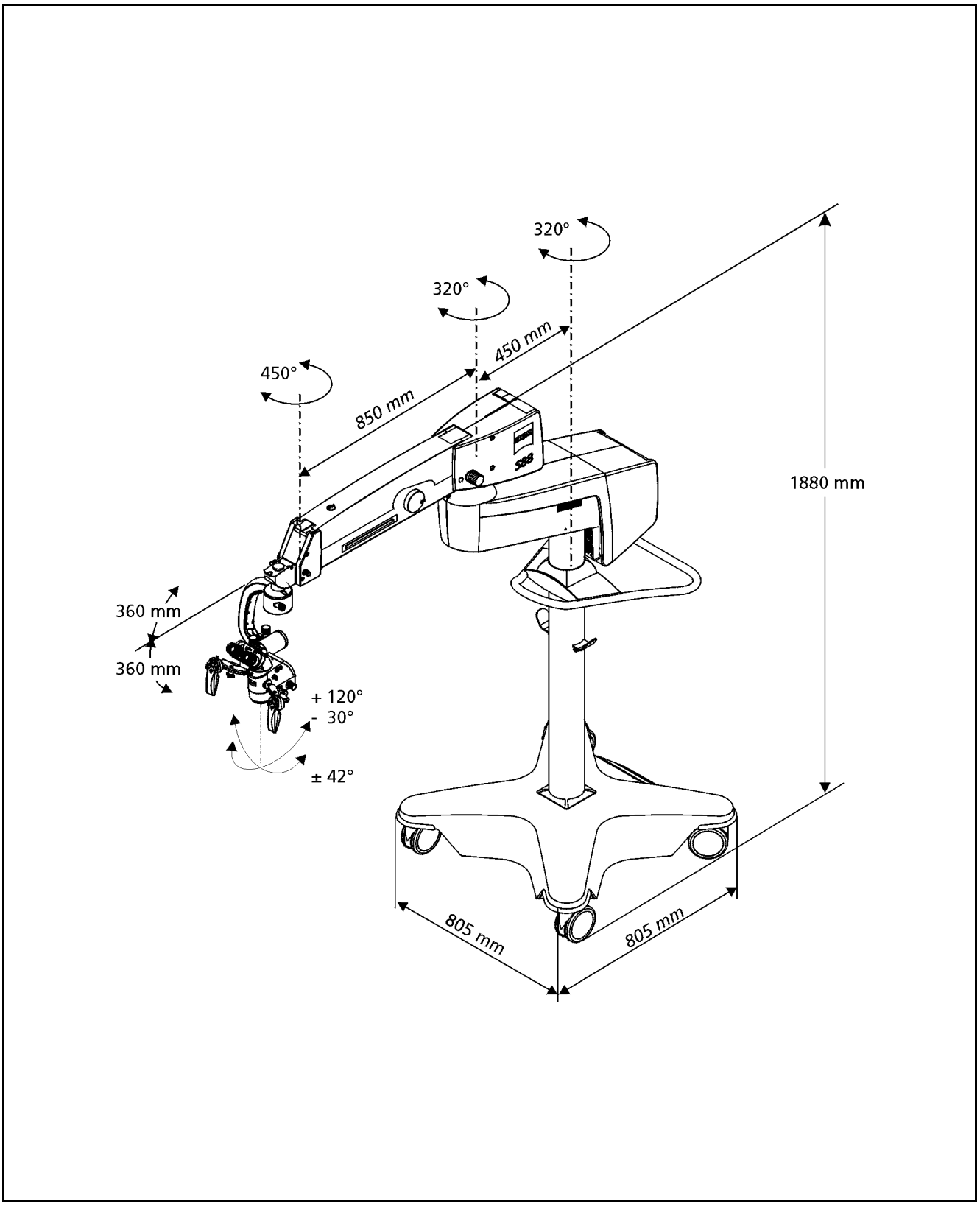
| | |
|---|---|
| Magnification | Motorized zoom system, zoom ratio 1:6, magnification factor $\gamma$ = 0.4x - 2.4x. |
| Total magnification with 10x eyepiece: | 2.4x - 14.6x at a working distance of 200 mm<br>1.5x - 8.7x at a working distance of 415 mm |
| Total magnification with 12.5x eyepiece: | 3x - 18.2x at a working distance of 200 mm<br>1.9x - 10.9x at a working distance of 415 mm |
| Fields of view with 10x eyepiece: | 14 mm - 84 mm at a working distance of 200 mm<br>23 mm - 141 mm at a working distance of 415 mm |
| Fields of view with 12.5x eyepiece: | 12 mm - 73 mm at working distance of 200 mm<br>20 mm - 116 mm at a working distance of 415 mm |
| Focusing | Continuous motorized focusing via integrated Varioskop. Focusing range 200 mm to 415 mm |
| Focal lengths f | At a working distance of 200 mm: f = 279 mm,<br>at a working distance of 300 mm: f = 366 mm,<br>at a working distance of 415 mm: f = 467 mm |
| Illuminated field diameter | At a working distance of 200 mm<br>min. 11 mm / max. 95 mm<br><br>At a working distance of 415 mm<br>min. 13 mm / max. 165 mm |
| Tubes / Eyepieces | 180° tiltable binocular tube, f = 170 mm<br><br>10x widefield eyepieces (option: 12.5x ) with magnetic coupling. |
| Electrical standard | Complying with IEC 60601-1/ EN 60601-1; UL 60601-1;<br>CAN/CSA-C22.2 No. 601.1-M90<br><br>Protection class I,<br>Type B equipment |
| Weight | 8.80 kg, OPMI Vario with standard suspension system (excl. tube and eyepieces)<br>12.25 kg, OPMI Vario with X-Y coupling (excl. tube and eyepieces) |

# Technical data of S88 floor stand

**S88 floor stand**

Mechanical data

| | |
|---|---|
| Suspension arm | Length...850 mm<br>Swivel angle...320°<br>Vertical lift...± 360 mm |
| Carrier arm | Length...450 mm<br>Swivel angle...320° |
| Stand height | 1880 mm |
| Base | 805 x 805 mm (length x width) |
| Admissible max. load on suspension arm | 20 kg (complete microscope equipment, including accessories) |
| Total weight | Approx. 215 kg |


320°
320°
450 mm
450°
850 mm
1880 mm
360 mm
360 mm
+ 120°
- 30°
± 42°
805 mm
805 mm

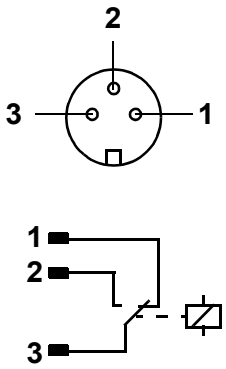
Electrical data of S88 floor stand

| | |
|---|---|
| Power requirements | Only connect the suspension system to wall outlets which are provided with a properly connected protective ground conductor. |
| Rated voltage | 115 VAC (100...125 VAC± 10%)<br>230 VAC (220...240 VAC± 10%) |
| Current consumption | 115 VAC max.10 A<br>230 VAC max. 8 A |
| Rated frequency | 50...60 Hz |
| Fuses | Automatic circuit breaker |
| Electrical outlets | Power outlet 115/230 VAC, max. 5 A<br>Power outlet 115/230 VAC, max. 2 A<br>(Via power switch)<br>X-Y coupling<br>Surgical microscope<br>Remote control socket for an external signal of a maximum of 24 V / 0.5 A. |
| Electrical standard | Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90<br>Protection class I, degree of protection IPXO<br>Type B equipment <br>Product classification I as per directive 93/42/EEC, Annex IX |
| Approval | 176164 C US |
| EMC requirements | The system meets the EMC requirements of IEC 60601-1-2.<br>The system meets the RFI requirements of Class A (hospital grade). |

The system has been designed for continuous operation.

Remote socket

View of connector side



Xenon illumination system

| | |
|---|---|
| Fiber optic illumination | Xenon short-arc reflector lamp<br>Color temperature: approx. 5000 K<br>Rated power: approx. 100 W<br>Backup lamp in lamp housing, manually selectable. |

Retrolux illumination module

| | |
|---|---|
| Height | 43 mm |
| Weight | 0.7 kg |
| Working distance | 150 mm - 350 mm |
| Stop | Retinal protection device |
| Filter | UV filter |

Video monitor

| | |
|---|---|
| LCD display | TFT color monitor |
| Screen size | 15" |
| Resolution | 1024 x 768 |
| Reaction time | 25 ms |
| Brightness | 200 cd/$m^2$ |
| Contrast ratio | 200:1 |
| Display colors | 16.7 million |
| Sampling rate | Horizontal: 30 - 80 KHz, vertical: 50 - 75 Hz |
| Viewing angles | Horizontal: 178°, vertical: 178° |
| Video input ports | DVI, VGA, S-Video, cVBS (Video), Component |
| Power input | 24 VDC ± 20% |
| Power consumption | 28W |
| Weight | 3.2 kg |
| Dimensions (H x W x D) | 286 x 348 x 51 mm |

S-Video mode, Composite mode

| Resolution | Refresh rate (HZ) | Description |
|---|---|---|
| 640 x 480 | 50 | - |
| 640 x 480 | 60 | NTSC |
| 720 x 576 | 50 | PAL |
| 720 x 576 | 60 | - |

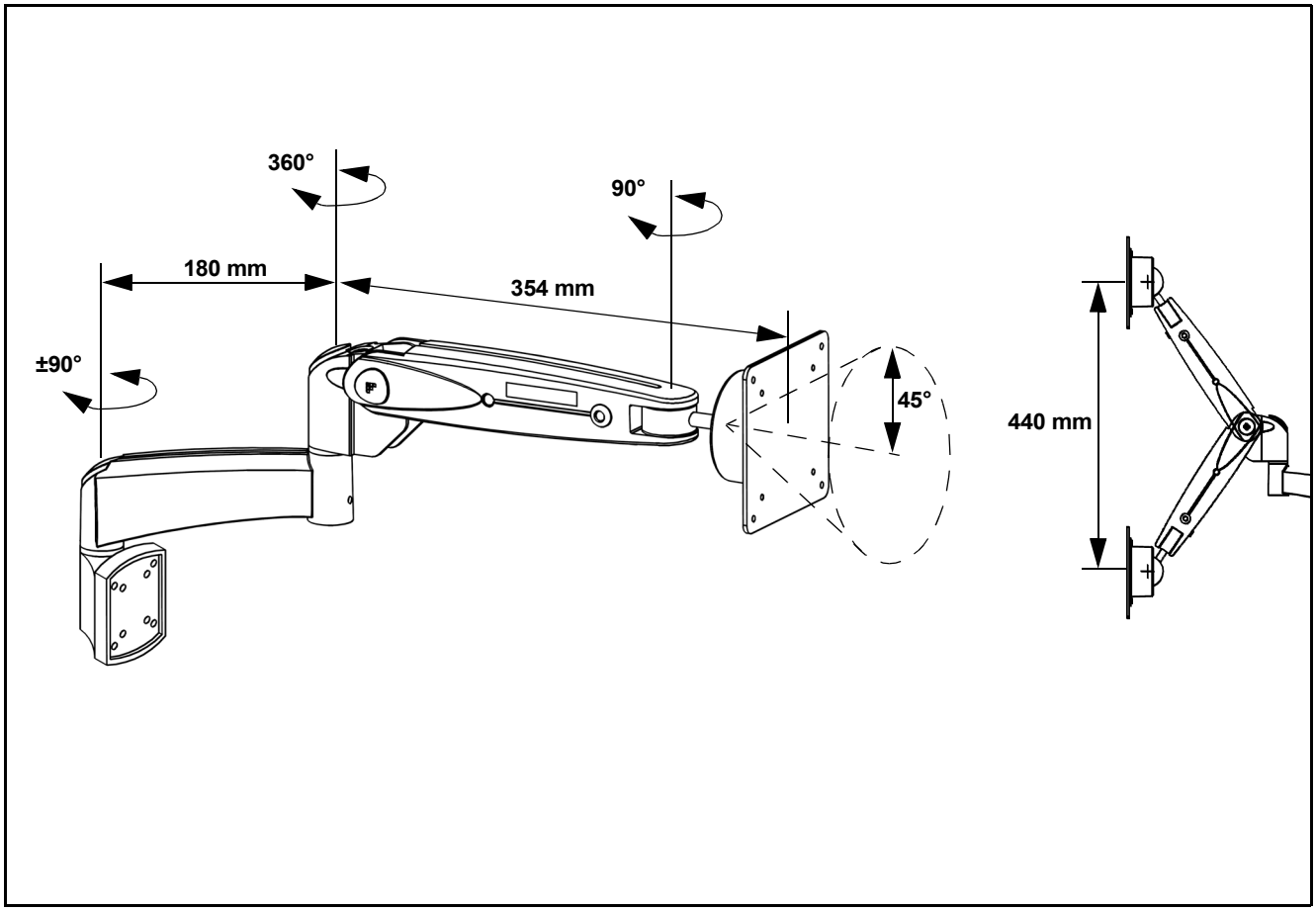
DVI mode,VGA mode, Component mode

| Resolution | Refresh rate (HZ) | Description |
|---|---|---|
| 640 x 480 | 50 | - |
| 640 x 480 | 60 | - |
| 720 x 576 | 50 | - |
| 720 x 576 | 60 | - |
| 800 x 600 | 50 | - |
| 800 x 600 | 60 | VESA |
| 800 x 600 | 70 | VESA |
| 800 x 600 | 75 | VESA |
| 1024 x 768 | 50 | - |
| 1024 x 768 | 60 | VESA |
| 1024 x 768 | 70 | VESA |
| 1024 x 768 | 75 | VESA |

**Monitor arm**

Mechanical data

| | |
|---|---|
| Suspension arm: | Length...354 mm<br>Swivel angle...360°<br>Vertical lift...± 220 mm |
| Carrier arm | Length...180 mm<br>Swivel angle...± 90° |
| Admissible max. load on the monitor arm | 9.0 kg |
| Total weight | Approx. 4.13 kg |



## Ambient requirements

| | | |
|---|---|---|
| For operation | Temperature<br>Rel. humidity<br>Air pressure | +10 °C...+40 °C<br>30%...75%<br>700 hPa...1,060 hPa |
| For transportation and storage | Temperature<br>Rel. humidity (without condensation)<br>Air pressure | - 40 °C...+70 °C<br>10%...100%<br><br>500 hPa...1,060 hPa |

## CE conformity

The system meets the essential requirements stipulated in Annex I to the 93/42/EEC Directive governing Medial Devices. The system is labeled with: CE

## Changes to the system

Subject to changes in design and scope of delivery as a result of ongoing technical development.

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